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NATIONAL DAM INSPECTION PROGRAM. ROBINSON DAM (NDI ID NUMBER PA--ETC(U)
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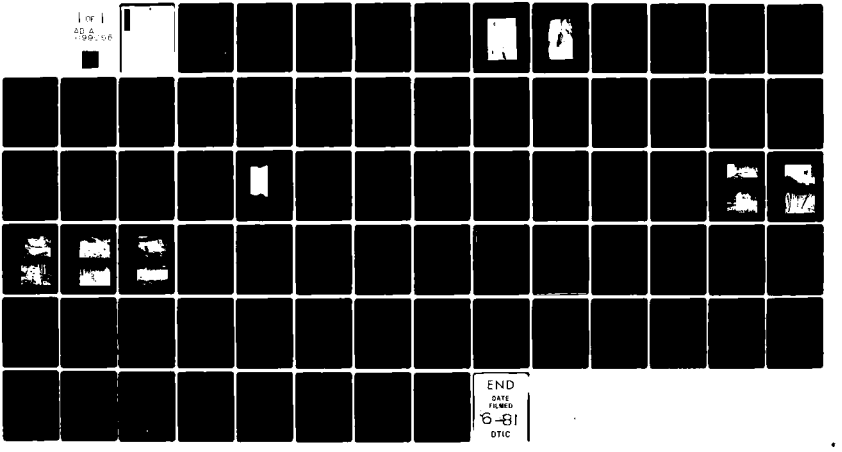

DELAWARE RIVER BASIN

TRIBUTARY OF MIDDLE CREEK, WAYNE COUNTY

PENNSYLVANIA .

(6) National Dam Inspection Program.

ROBINSON DAM

(NDI ID Number PA-00165
DER ID No. 64-136)

~~LEISURE LIFE CORP. OF AMERICA~~

Delaware River Basin,
Tributary of Middle Creek
Wayne County, Pennsylvania.

PHASE I INSPECTION REPORT .

NATIONAL DAM INSPECTION PROGRAM

(12) '76

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Prepared by:

DEPARTMENT OF THE ARMY
Baltimore District, Corps of Engineers
Baltimore, Maryland 21203

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(11) FEB 81

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PREFACE

This report is prepared under guidance contained in the Recommended Guidelines for Safety Inspection of Dams, for Phase I investigations. Copies of these guidelines may be obtained from the Office of Chief of Engineers, Washington, D.C. 20314. The purpose of a Phase I investigation is to identify expeditiously those dams which may pose hazards to human life or property. The assessment of the general condition of the dam is based upon available data and visual inspections. Detailed investigation and analyses involving topographic mapping, subsurface investigations, testing, and detailed computational evaluations are beyond the scope of a Phase I investigation; however, the investigation is intended to identify any need for such studies.

In reviewing this report, it should be realized that the reported condition of the dam is based on observations of field conditions at the time of inspection along with data available to the inspection team.

It is important to note that the condition of a dam depends on numerous and constantly changing internal and external conditions, and is evolutionary in nature. It would be incorrect to assume that the present condition of the dam will continue to represent the condition of the dam at some point in the future. Only through frequent inspections can unsafe conditions be detected and only through continued care and maintenance can these conditions be prevented or corrected.

Phase I inspections are not intended to provide detailed hydrologic and hydraulic analyses. In accordance with the established guidelines, the spillway design flood is based on the estimated "Probable Maximum Flood" for the region (greatest reasonably possible storm runoff), or fractions thereof. The spillway design flood provides a measure of relative spillway capacity and serves as an aid in determining the need for more detailed hydrologic and hydraulic studies, considering the size of the dam, its general condition, and the downstream damage potential.

NDI ID No. PA-00165, DER ID No. 64-136

PHASE I INSPECTION REPORT

NATIONAL DAM INSPECTION PROGRAM

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PHASE I INSPECTION REPORT
NATIONAL DAM INSPECTION PROGRAM

BRIEF ASSESSMENT OF GENERAL CONDITION
AND
RECOMMENDED ACTION

Name of Dam:	Robinson Dam NDI ID No. PA-00165 DER ID No. 64-136
Size:	Small (19.8 feet high; 190 acre-feet)
Hazard Classification:	High
Owner:	Leisure Life Corp. of America
State Located:	Pennsylvania
County Located:	Wayne
Stream:	Tributary of Middle Creek
Date of Inspection:	4 November 1980

Based on available records, visual inspection, and engineering calculations, Robinson Dam is considered to be in poor condition and is judged to be unsafe, non-emergency.

The collapsed section of the downstream face, the cracking of the corewall and the blocked spillway and outlet works are reasons for immediate concern. Maintenance procedures need to be established and the spillway, outlet works, and embankment need to be rehabilitated.

Based on the size and hazard classification of the dam, the recommended Spillway Design Flood (SDF) varies between 1/2 the Probable Maximum Flood (PMF) and the PMF. Based on the size of the dam and reservoir, and the downstream conditions, the 1/2 PMF has been selected as the SDF. The hydrologic and hydraulic computations indicate that the combination of reservoir storage and spillway discharge capacity will pass only 11 percent of the PMF without overtopping the embankment. Overtopping the dam could cause failure, which would lead to a significant increase in downstream loss of life and property damage. Therefore, spillway for Robinson Dam is considered to be seriously inadequate.

The following measures should be undertaken immediately by the owner of the dam:

1. Retain a qualified professional engineer to perform a detailed investigation of the stability of the embankment, including development of remedial measures necessary to place the dam in safe condition. These remedial measures should be implemented immediately.

2. Perform a detailed hydrologic and hydraulic study by a qualified professional engineer to develop plans for increasing the capacity of the existing spillway to an adequate level. This study should also include an evaluation of the adequacy of the existing spillway and outlet channels.

3. The outlet structure should be rehabilitated and provided with a positive upstream closure.

4. All brush and trees should be removed from the embankment slopes. Removal of tree stumps and root systems should be done under the supervision of a qualified professional engineer.

5. All extraneous pipes extending through the embankment should be thoroughly sealed.

6. Riprap should be replaced in areas where needed for wave protection on the upstream embankment.

7. A formal surveillance and downstream emergency warning system should be developed for use during periods of high or prolonged precipitation.

8. An operation and maintenance manual or plan should be prepared for use as a guide in the operation of the dam during normal and emergency conditions.

9. A schedule should be developed for regular inspection and routine maintenance of the dam and appurtenances.

Approved by:

DEPARTMENT OF THE ARMY
BALTIMORE DISTRICT, CORPS OF ENGINEERS

Date: 9 APR 81

JAMES W. PECK
Colonel, Corps of Engineers
District Engineer

ROBINSON DAM

OVERVIEW - PRESENT CONDITION

PHASE I INSPECTION REPORT
NATIONAL DAM INSPECTION PROGRAM

ROBINSON DAM

NDI-ID NO. PA-00165
DER-ID NO. 64-136

SECTION 1 - PROJECT INFORMATION

1.1 General.

a. Authority.

The National Dam Inspection Act, Public Law 92-367, authorized the Secretary of the Army, through the Chief of Engineers, to initiate a program of inspection of dams throughout the United States.

b. Purpose

The purpose of this inspection is to determine whether Robinson Dam constitutes a hazard to human life and property.

1.2 Description of Project.

a. *Description of Dam and Appurtenances.*

Note: The U.S.G.S. quadrangle sheet (Waymart, Pa.) indicates a reservoir elevation of 1643, which is used in this report as existing spillway crest elevation.

Robinson Dam is an earthfill and dry stone masonry structure with a concrete core wall. The overall length of the dam is approximately 340 feet and the low point of the dam's crest is 19.8 feet above the downstream toe. A 12 foot wide spillway area is located near the left abutment, and a drop inlet structure is located approximately midway across the embankment. Flow into the inlet is controlled by removable wooden stoplogs, currently having an invert elevation approximately two feet below existing top of dam. The outlet for this structure discharges into the natural stream channel at the downstream toe of the embankment.

The original embankment design called for an earth and stone structure 170 feet in length and 15 feet in height, having a concrete corewall extending from four feet below natural ground to top of dam.

There is no record of any modifications being made to the dam.

b. Location: South Canaan Township Wayne County
U.S.G.S. Quadrangle - Waymart, Pa.
Latitude 41^{0} 21.8' Longitude 75^{0} 27.2'
Ref. Appendix E, Plates I & II.

c. Size Classification: Small: Height - 19.8 feet
Storage - 190 acre-feet

d. Hazard Classification: High (Ref. Section 3.1.e.)

e. Ownership: Leisure Life Corporation of America
C/O Attorney Henry Biglin
Hop Bottom, Pennsylvania

f. Purpose: Recreation

g. Design and Construction History.

The dam was "designed" by Mr. F.G. Meyer for Mr. William H. Robinson. The dam was built by Mr. Robinson and his sons and was completed in 1938. There are no records of any work being performed on the dam since that date. The dam was eventually sold to the Leisure Life Corporation by Mr. Robinson's grandsons, Daniel and Virgil Robinson. Leisure Life Corporation has subsequently defaulted on the mortgage for the property. Mr. Andrew Halestone, lawyer for Daniel and Virgil Robinson, is currently taking action to foreclose and reclaim the property. Mr. Halestone's address is: 200 Bank Towers, Scranton, Pennsylvania 18503.

h. Normal Operating Procedures.

There are no current operating procedures for the dam. Normal pool is maintained by water entering the drop inlet structure and discharging through the outlet conduit. The spillway section is essentially blocked, so that any excess flow must be discharged through or overtop the masonry and earth embankment.

1.3 Pertinent Data.

a. Drainage Area (square miles).

From files:	1.50
Computed for this report:	0.50
Use:	0.50

b. Discharge at Damsite (cubic feet per second).

Maximum known flood	Unknown
Outlet works at maximum pool (El.1644.2)	Conduit size unknown
Spillway at maximum pool (El.1644.2)	45

c. Elevations (feet above mean sea level).

Note: Reservoir elevation of 1643 as shown on U.S.G.S. quad sheet Waymart is used as present spillway crest elevation.

c. Elevations (feet above mean sea level) (Cont'd):

Top of dam (low point)	1644.2
Top of dam (design)	unknown
Spillway crest (as surveyed)	1643.0
Spillway crest (design)	unknown
Outlet works (top of stoplogs)	1642.0
Downstream culvert invert	unknown
Streambed at toe of dam	1624.4

d. Reservoir Length (miles).

Spillway crest (El.1643.0)	0.34
Maximum pool (El.1644.2)	0.36

e. Storage (acre-feet).

Spillway crest (El.1643.0)	150
Maximum pool (El.1644.2)	190

f. Reservoir Surface (acres)

Spillway crest (El.1643.0)	30.1
Maximum pool (El.1644.2)	32.0

g. Dam.

Note: Refer to Exhibits in Appendix A for plan and section.
Type: Concrete core wall w/earthfill upstream and dry stone masonry downstream.
Length: 340 feet (incl. spillway)
Height: 19.8 feet (field measured; low point to d/s toe)
Top width: 17.0 feet
Side slopes:

Upstream:	1V on 4H upper 4'; 1V on 2H below at maximum section otherwise 1V on 4H
Downstream:	Vertical except for 1V on 1.2H where material is added

Zoning: Concrete core wall
Cutoff: Corewall extends 4 feet into natural ground.
Grouting: None reported

h. Outlet Works:

Type: 3'x3' drop inlet with stoplog face; conduit size and type unknown.
Location: 200' from left abutment on U/S face
Closure: None reported or observed.

i. Spillway:

Type: Uncontrolled, rectangular, stone-lined with broad crest.
Length: 12 feet
Location: Dam crest; 100 feet from left abutment.
Low Flow Notch: None
Approach Channel: Reservoir
Downstream Channel: Rock-lined

SECTION 2

ENGINEERING DATA

2.1 Design.

Engineering design data for Robinson dam are extremely limited. The available information consists of one rough sketch dated August 1934 showing a profile and section of the proposed dam.

2.2 Construction.

The construction data is limited to a progress report by the Pennsylvania Dept. of Environmental Resources (PennDER) dated 25 May 1938 which mentioned some cracking of the corewall taking place due to ice damage. The PennDER inspector recommended placing riprap to protect against further damage. The report indicated that the dam was being built under the supervision of the original owner, Mr. William Robinson. From the data obtained during the field inspection, it is apparent that either the dam was originally built higher than the PennDER permit called for, or has been raised at some unknown date. The 1965 PennDER inspection stated the dam height as 15 feet, which may not have been verified by field measurement. There is no record in PennDER files of any application for raising the dam, except a note in a progress report during original construction stating that the owner was planning on raising the dam by 3 feet at some future date.

Based on PennDER's 1965 inspection, the owner was requested to clear the spillway opening, which apparently was never done.

2.3 Operation.

No formal records of operation or maintenance exist. An inspection report by PennDER in March 1965 stated that there was some leakage at the downstream toe, the spillway was filled in, and the concrete core wall was cracking. The report assessed the dam to be in fair to poor condition.

2.4 Evaluation.

a. Availability.

The only available written information and data on this dam are contained in the files of PennDER. These files contain rough sketches of the proposed structure, which do not correspond in many details to the dam as it currently exists. The files also contain limited inspection and progress reports and related correspondence.

b. Adequacy.

The available data, including that collected during the recent detailed visual inspection are considered to be adequate to make a reasonable assessment of the dam.

SECTION 3

VISUAL OBSERVATIONS

3.1 Observations.

a. General.

The overall appearance of the dam and appurtenances is poor. A portion of the downstream face of the dry stone masonry has collapsed. The spillway is filled with stones to within approximately one foot of the top of the dam. On the day of the inspection, the pool was 2.5 feet below the top of the dam. The owner did not accompany the inspectors to the dam.

The visual inspection checklist and sketches of the general plan, profile and cross-sections of the dam, as surveyed during this inspection, are presented in Appendix A of this report. Photographs taken during the inspection are reproduced in Appendix C.

b. Dam.

The vertical alignment of the dam crest is irregular with the low point adjacent to the left side of the spillway. The horizontal alignment is straight except for localized collapse of the downstream face and leaning of the corewall. The crest width averages 15 feet downstream of the core wall. A 20 foot x 6 foot wide section of the vertical downstream face of the dry stone masonry dam has collapsed at the dam's maximum section. The rubble is blocking the outlet conduit and a portion of the discharge channel. The date of this collapse is unknown. Clear water is flowing from this area into the streambed at a rate of approximately 8 gallons per minute. The area immediately to the left of this collapsed section shows signs of instability.

Additional material has been placed against the downstream face on a slope of 1V on 1.2H from the spillway to within 10 feet of the maximum section. Construction photographs indicate that entire downstream face was originally constructed vertically. Eight to ten inch diameter trees are growing adjacent to the toe. Smaller trees and brush are growing along the upstream limit of the crest. Eight to ten inch riprap protects the left two-thirds of the upstream face. No riprap exists on the right one-third. The upstream face slopes at 1V on 4H for the upper 4 feet and 1V on 2H below at the maximum section; otherwise 1V on 4H.

The top of the core wall is exposed between the left abutment and the spillway and adjacent to the drop inlet. The portion left of the spillway is severely cracked and broken in several locations and is leaning downstream at an angle which varies from 15-45 degrees.

c. Appurtenant Structures.

The spillway is located on the dam crest approximately 100 feet from the left abutment. The approach is directly from the reservoir and there are no obstructions. However, the spillway is filled with stones to within

1.2 feet of the dam's low point. The upstream ends of the spillway walls are broken and in very poor condition. The downstream limits of the walls are coincident with the downstream face of the dam. Looking toward the spillway from downstream, a broken concrete slab is visible approximately 2 1/2 feet below the existing spillway crest. The walls and slab were apparently placed directly on the stone masonry and not carried to natural grade.

The outlet works consist of a drop inlet which is located 200 feet from the left abutment and in line with the core wall. The two sides and downstream face are formed concrete except that large stones are formed into the upper two feet of the sides. The roots from a six inch tree to the right of the inlet are growing through cracks in the upper portion of the inlet wall and down along the inside face. The top of the inlet is a piece of plywood held down by the stones. The upstream face consists of wooden stoplogs in fair condition with no visible leakage. Removal of these stoplogs would cause erosion of the adjacent earthfill since the upstream slope of the dam is continuous across the location of the inlet. There is no evidence of any control. The bottom of the inlet is filled with water to sufficient depth that the outlet conduit cannot be seen. Movement of this water can be detected but the source is unclear. As stated previously, the debris on the downstream slope prevents the examination of the outlet conduit or any outlet structure.

d. Reservoir Area.

The mostly wooded watershed slopes are moderate to steep and appear stable. Residential development is limited to a few farm houses. No siltation is apparent or reported.

e. Downstream Channel.

The downstream channel for the spillway is rock-lined with no obstructions. The channel begins perpendicular to the dam axis and is straight for about twenty feet before bending to the right and paralleling the embankment until reaching the original streambed. The streambed has a natural rock bottom with light woods on the mild side slopes.

The first obstruction downstream is a road culvert about 500 feet from the dam. Immediately upstream of this culvert is one house with the first floor approximately nine feet below top of dam. The proximity of this residence to the stream constitutes a high hazard to loss of life should the dam fail. A second house is located 8,700 feet downstream of the dam with the first floor approximately 12 feet above the streambed. Lake Quinn is 2.4 miles downstream of the dam.

f. Evaluation.

The condition of Robinson Dam and its appurtenances is considered to be poor. The collapse of a portion of the downstream face causes concern for the stability of the adjacent areas. Further investigation of the causes and impact of this collapse is warranted. The outlet works is essentially inoperable with no apparent means of safely drawing down the lake. In addition the spillway is practically nonfunctional in its present condition.

SECTION 4

OPERATIONAL PROCEDURES

4.1 Normal Operating Procedure.

The facility is essentially self-regulating. Inflow would normally pass through the intake structure and outlet conduit. Inflows in excess of the capacity of the outlet works would flow through the spillway and over the dam. No formal operations manual exists.

4.2 Maintenance of Dam.

The conditions of the facility as observed by the inspection team is indicative of a general lack of maintenance. A partial collapse of the embankment downstream slope and the obstruction of the outlet conduit are areas that should be repaired. No formal maintenance manual exists. Routine inspection of the dam is currently not performed.

4.3 Maintenance of Operating Facilities.

See Section 4.2 above.

4.4 Warning System.

No formal warning system exists.

4.5 Evaluation.

Maintenance of the facility is inadequate. Restoration of the outlet works and the embankment in the partially collapsed downstream portion is required. Formal manuals of maintenance and operation are recommended to ensure that all needed maintenance is identified and performed regularly. In addition, a formal warning system for the protection of downstream inhabitants should be developed. Included in the plan should be provisions for around-the-clock surveillance of the facility during periods of unusually heavy precipitation.

SECTION 5

HYDROLOGIC/HYDRAULIC EVALUATION

5.1 Design Data.

No design reports, calculations, or miscellaneous design data are available for the facility.

5.2 Experience Data.

Records of reservoir levels and/or spillway discharges are not available. No records of past performance are available.

5.3 Visual Observations.

On the date of the inspection, conditions were observed that indicated that the outlet facility would not operate satisfactorily during a flood event. In addition, fill has been placed in the spillway at an undetermined time in the past. The additional fill reduces the capacity of the dam and spillway to pass a flood event.

5.4 Method of Analysis.

The facility has been analyzed in accordance with procedures and guidelines established by the U.S. Army, Corps of Engineers, Baltimore District, for Phase I hydrologic and hydraulic evaluations. The analysis has been performed using a modified version of the HEC-1 program developed by the U.S. Army, Corps of Engineers, Hydrologic Engineering Center, Davis, California. Capabilities of the program are briefly outlined in the preface contained in Appendix D.

5.5 Summary of Analysis.

a. Spillway Design Flood (SDF). In accordance with procedures and guidelines contained in the National Guidelines for Safety Inspection of Dams for phase I investigations, the Spillway Design Flood (SDF) for Robinson Lake Dam ranges between the 1/2 Probable Maximum Flood (PMF) and the full PMF. This classification is based on the relative size of the dam (small), and the potential hazard of dam failure to downstream developments (high). Due to the small storage (less than 200 ac-ft) and height of dam (less than 20 feet) the SDF selected was the 1/2 PMF.

b. Results of the Analysis.

Robinson Lake Dam was evaluated under near normal operating conditions. Since the outlet conduit has been obstructed, it was ignored in the analysis and the starting water surface elevation was set at elevation 1643.0 (spillway crest). As previously mentioned, the spillway has additional rock and fill placed in it leaving only 1.2 feet of freeboard between the existing spillway crest and the low point of top of dam. All pertinent engineering calculations are provided in Appendix D.

The overtopping analysis (using HEC1-DB) indicated that the discharge/storage capacity of Robinson Lake Dam can accommodate only about 11 percent of the PMF. Under 1/2 PMF (SDF) conditions the dam is overtopped 9.7 hours to a maximum depth of approximately 1.0 foot. Since the SDF for this dam is the 1/2 PMF, it can be concluded that the dam has a high potential for overtopping, and thus, for breaching under floods of less than SDF magnitude.

To determine if the spillway is seriously inadequate three conditions must be met.

(i) There is a high hazard to loss of life from large flows downstream of the dam.

(ii) The spillway is not capable of passing 1/2 PMF without overtopping the dam and causing failure.

(iii) Dam failure resulting from overtopping would significantly increase the hazard to loss of life downstream of the dam from that which would exist just before overtopping failure.

As Robinson Lake Dam cannot safely accommodate at least 1/2 PMF, a breach analysis is required.

The modified HEC-1 Computer Program was used for the breaching analysis. Since the dam contains a core wall and is rock filled, it is assumed the dam can withstand 1/2 foot of overtopping for short durations. Therefore, the water surface elevation that would cause failure was assumed to be 1644.7.

Four breach models were analyzed under conditions that would approximate 1/2 foot of overtopping. The flood routed was 25% PMF as indicated in Appendix D. Plan 1 was a non-breach run and was inserted into the model to provide a direct means of comparing failure vs. non-failure conditions under the same flood event. Failure times used were 0.33 hour (Plan 2), 1.00 hour (Plan 3) and 2.00 hours (Plan 4). In addition downstream damage centers are given with appropriate channel characteristics and reach lengths. Page D-12 of Appendix D provides peak outflows and changes in stage at the downstream damage centers. Breach geometry is also discussed in Appendix D.

The results of the breach analysis indicated significant increases in stage at downstream damage centers between failure and non-failure conditions.

5.6 Spillway Adequacy.

Under existing conditions Robinson Lake Dam can accommodate only about 11 percent of the PMF. Should an event in excess of this occur, the dam would be overtopped and could possibly fail. Since the failure of this dam would lead to increased property damage or loss of life at existing downstream residences, the spillway capacity is considered to be seriously inadequate.

SECTION 6

STRUCTURAL STABILITY

6.1 Evaluation of Structural Stability.

a. Visual Observations.

(1) Embankment.

Visual observations of Robinson Dam indicate that the dam is in poor condition. The dry laid stone mass downstream of the corewall is approximately 15 feet wide and has a vertical downstream face. A segment of this stone has collapsed at the maximum section of dam. The collapsed segment is approximately 20 feet long, 6 feet in width perpendicular to the dam axis, and the full height of the dam. The dry laid stone immediately to the left of the collapsed segment shows signs of instability. The concrete corewall is believed to be broken horizontally. It has a downstream tilt which varies from about 15 to 45 degrees. This tilt was probably caused by ice forces. Photographs from 1935 show that this wall was vertical; however, there is no sign of movement in the embankment other than the collapsed segment and the unstable adjacent stone. Water is seeping through the upstream earth embankment into the drop inlet and discharging into the outlet channel at approximately 8 gpm. The water being discharged is clear. Trees are growing on the embankment. The left and middle thirds of the upstream slope are protected by 8 to 10 inch riprap. The right upstream one third has a 5H:1V slope, no rip rap, and no erosion.

(2) Appurtenant Structures.

The spillway walls and concrete weir are cracked and broken. The spillway has been filled with dry laid stone and covered with fill on the crest. This leaves a shallow depression overgrown with weeds at the spillway. The outlet works consists of a drop inlet and an outlet conduit. The conduit could not be observed because of the collapsed segment of downstream slope. In the drop inlet, the concrete walls are cracked and broken near the top of the inlet. Timber stop logs are used to control the water level. However, fill and riprap have been placed in front of the inlet up to the level of the existing top of stop logs.

b. Design and Construction Data.

(1) Embankment.

There are no known design data for this dam. A sketch of a profile and cross section of the proposed dam were submitted to the Water and Power Resources Board (now PennDER) for a construction permit in 1934. Construction data consist of a few photographs when the dam was near completion and several memoranda and a progress report by the Water and Power Resources Board engineers.

A review of these data indicates that the dam was to be 170 feet long and 15 feet high. The concrete corewall was to have an 18 inch wide base, be set in a 4 foot deep cutoff trench and have a width of 12 inches at the top of dam. Test pits reveal that the dam foundation is clay. The upstream rolled earth was shown to have a slope of 2H:1V which agrees with the measured slope at the maximum section. The downstream dry laid stone mass was shown to have a planned base width of 15 feet, a top width of 10 feet, and a downstream slope that has a 1H:2V batter. The wall was built with a vertical downstream face, however.

(2) Appurtenant Structures.

The sketch that accompanied the construction permit application indicated that the spillway would be 12 feet wide and 16 inches deep. There is no data concerning the drop inlet, outlet conduit, or design and construction of the spillway. Measurements at the downstream end of the spillway indicate that the spillway was 28 inches deep before it was filled in to the present depth of 14.4 inches.

c. Operating Records.

There are no records of operation.

d. Postconstruction Changes.

None reported.

e. Seismic Stability.

Robinson Dam is located in Seismic Zone 1. Normally a statically stable dam in Zone 1 is considered to be seismically stable. This dam however, has already collapsed in one segment and is unstable in the adjacent rock mass. Earthquake activity could easily cause a failure of this unstable segment.

SECTION 7

ASSESSMENT AND RECOMMENDATIONS

7.1 Dam Assessment.

a. Safety.

The visual inspection and review of available design and construction data indicate that Robinson Dam is in poor condition. The collapsed section of the downstream face, the cracking of the corewall and the blocked spillway and outlet works are reasons for immediate concern. Maintenance procedures need to be established and the spillway, outlet works, and embankment need to be rehabilitated. The dam in its present condition is considered unsafe, non-emergency.

The hydrologic and hydraulic computations indicate that the combination of reservoir storage and spillway discharge capacity will pass only 11 percent of the PMF without overtopping the embankment. Therefore, in accordance with the criteria outlined and evaluated in Section 5.5b, the spillway for Robinson Dam is considered to be seriously inadequate.

b. Adequacy of Information.

The design and construction information contained in the PennDER files, in conjunction with data collected during the visual inspection, are considered to be adequate for making a reasonable assessment of this dam.

c. Urgency.

The recommendations presented below should be implemented immediately.

d. Necessity for Additional Studies.

The results of this inspection indicate a need for additional studies to ascertain methods of providing adequate spillway capacity and to further evaluate the structural stability of the dam, including development of necessary remedial plans. These studies should be performed by a professional engineer experienced in the design and construction of dams.

7.2 Recommendations.

1. The owner should immediately retain a qualified professional engineer to perform a detailed investigation of the stability of the embankment, including development of remedial measures necessary to place the dam in safe condition. These remedial measures should be implemented immediately.

2. A detailed hydrologic and hydraulic study should be performed by a qualified professional engineer to develop plans for increasing the capacity

of the existing spillway to an adequate level. This study should also include an evaluation of the adequacy of the existing spillway and outlet channels.

4. The outlet structure should be rehabilitated and provided with a positive upstream closure.

5. All brush and trees should be removed from the embankment slopes. Removal of tree stumps and root systems should be done under the supervision of a qualified professional engineer.

6. All extraneous pipes extending through the embankment should be thoroughly sealed.

7. Riprap should be replaced in areas where needed for wave protection on the upstream embankment.

8. A formal surveillance and downstream emergency warning system should be developed for use during periods of high or prolonged precipitation.

9. An operation and maintenance manual or plan should be prepared for use as a guide in the operation on the dam during normal and emergency conditions.

10. A schedule should be developed for regular inspection and routine maintenance of the dam and appurtenances.

APPENDIX A

CHECKLIST - VISUAL INSPECTION

Check List
Visual Inspection
Phase 1

Name Dam Robinson Dam County Wayne State Pennsylvania

Date(s) Inspection 4 Nov 80 Weather Cloudy w/shwrs. Temperature 50°

Pool Elevation at Time of Inspection 1641.5 M.S.L. Tailwater at Time of Inpsection 1624.4 M.S.L.

Inspection Personnel:

J. Evans (Corps of Engr) B. Cortright (Corps of Engr.) _____

J. Bianco (Corps of Engr.) _____ _____

E. Hecker (Corps of Engr.)

B. Cortright Recorder

EMBANKMENT, CORE WALL AND STONE MASONRY

VISUAL EXAMINATION OF	OBSERVATIONS
Any Noticeable Seepage	Eight gpm of clear water flowing from toe at old streambed. Exact location of source obscured by stone from local collapse of d/s face.
Junction of Embankment with: Abutments Spillway Other Features	Good. No signs of erosion or settlement.
Foundation	Not observed.
Surface Cracks - Concrete	Surface cracks and spalling of exposed portions of core wall.
Structural Cracking	Exposed portions of core wall to the left of spillway are cracked vertically in several locations. Walls also lean max. 45^{o} ±d/s. Unable to determine if wall has broken off below grade or was constructed this way.
Crest Alignment: Vertical	Vertical - Irregular, varies 0.5' to 1.0' between maximum and minimum elevations with greatest variation near the abutments.
Horizontal	Horizontal - Straight; localized collapse of d/s face; corewall is leaning.
Surface Cracks Embankment	None observed.

EMBANKMENT, CORE WALL AND STONE MASONRY

VISUAL EXAMINATION OF	OBSERVATIONS
Unusual Movement or Cracking at or Beyond the Toe	None apparent.
Sloughing or Erosion: Embankment Slopes Abutment Slopes	6 foot wide x 20 foot long section of d/s face collapsed. Collapsed area is centered over original streambed. Area immediately left of failure shows signs of instability.
Riprap Failures	Very sparse riprap on right one-third of u/s face but no erosion or signs of failure.
Staff Gage and Recorder	None
Drains	None
Miscellaneous	Several 8"-10" dia trees growing immediately d/s of toe along entire length of dam. Four to six inch dia. trees on u/s face immediately right of spillway and left and right of drop inlet.
Instrumentation	None

OUTLET WORKS

VISUAL EXAMINATION OF	OBSERVATIONS
Outlet Conduit	Not observed. u/s end submerged in base of drop inlet and d/s end buried by collapse of dry masonry on d/s face. Eight inch iron pipe encased in concrete projecting from collapsed area approx. two feet below crest. Condition fair. Purpose unknown. Two iron pipes of 6 inch dia. visible on d/s face 5 feet left of inlet and 10 feet below crest. Condition fair. Purpose unknown.
Intake Structure	Plywood top. (not secured). U/S side is stoplogs in fair condition. Concrete in fair condition. Tree roots coming through cracks near top of left wall and running down inside face. No trash rack.
Outlet Structure	None observed. Collapsed portion of d/s face precluded any inspection if a structure does exist.
Outlet Channel	Original streambed. Collapsed portion of embankment blocks channel immediately d/s of outlet. Remainder of channel has rock bottom and is clear.
Emergency Gate	None observed.

UNGATED SPILLWAY

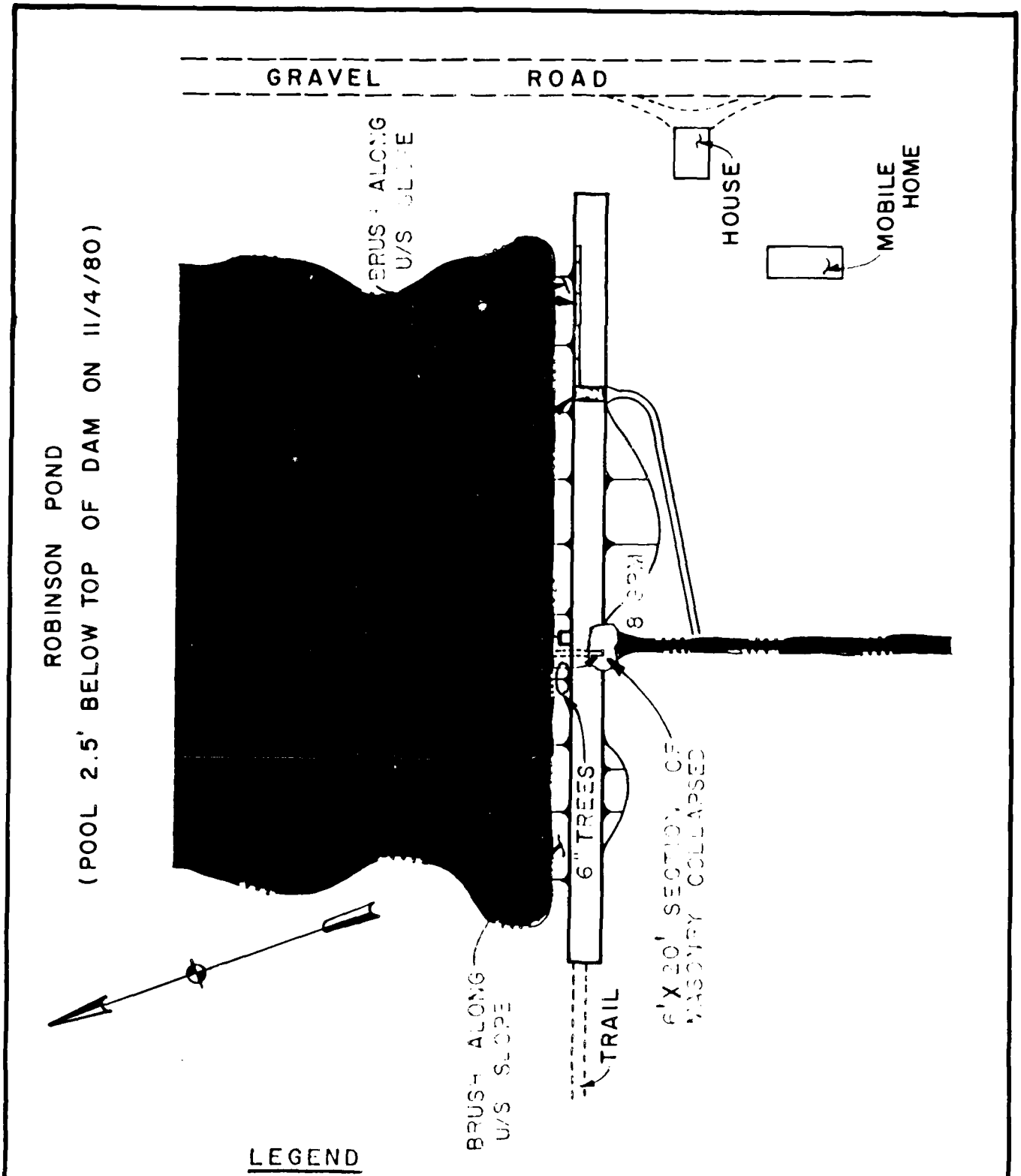
VISUAL EXAMINATION OF	OBSERVATIONS
Concrete Weir	Filled with stones to within one foot of crest.
Approach Channel	Reservoir - no obstructions.
Discharge Channel	Channel begins adjacent to spillway toe. Rock lined w/3' bottom - No obstructions.
Bridge and Piers	None.

DOWNSTREAM CHANNEL

VISUAL EXAMINATION OF	OBSERVATIONS
Conditions:	Rock bottom with trees along banks. Clear until culvert 500' d/s, then flows into small impoundment.
Slopes 1. Channel 2. Sides	1. Flat 2. Mild; wooded
Approximate number of Homes	One house 500' downstream with first floor approximately nine feet below the top of dam. Roadway 4,800 feet downstream with 6'x7' elliptical culvert. One house 8,700' downstream with first floor approximately 12 feet above streambed. Lake Quinn 2.4 miles downstream.

RESERVOIR AND WATERSHED

VISUAL EXAMINATION OF	OBSERVATIONS
Slopes	Right side - Steep and wooded. No apparent slide activity. Left side - Generally mild and wooded.
Sedimentation	None reported or observed.



LEGEND

8 GPM INDICATES LOCATION AND QUANTITY OF SEEPAGE

NOT TO SCALE

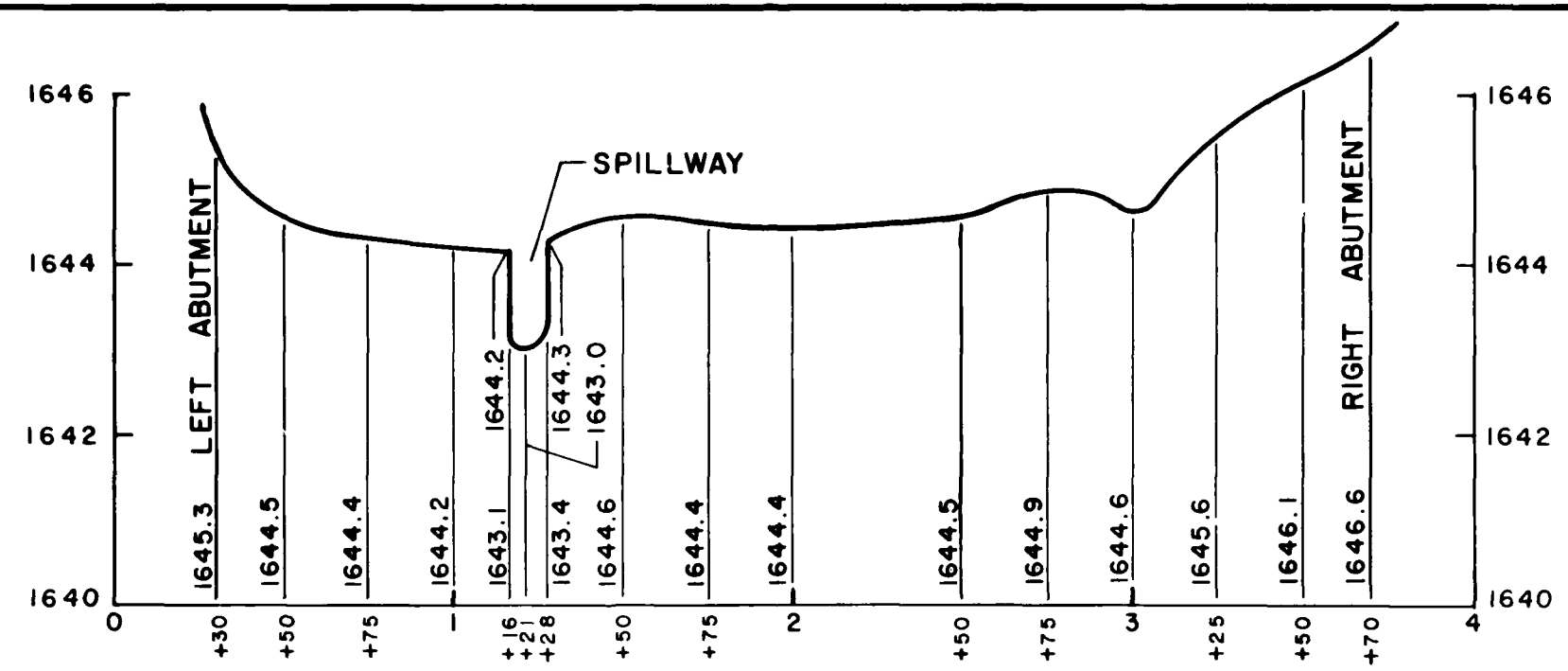
PHASE I INSPECTION REPORT
NATIONAL DAM INSPECTION PROGRAM

ROBINSON POND DAM

LEISURE LIFE INC.

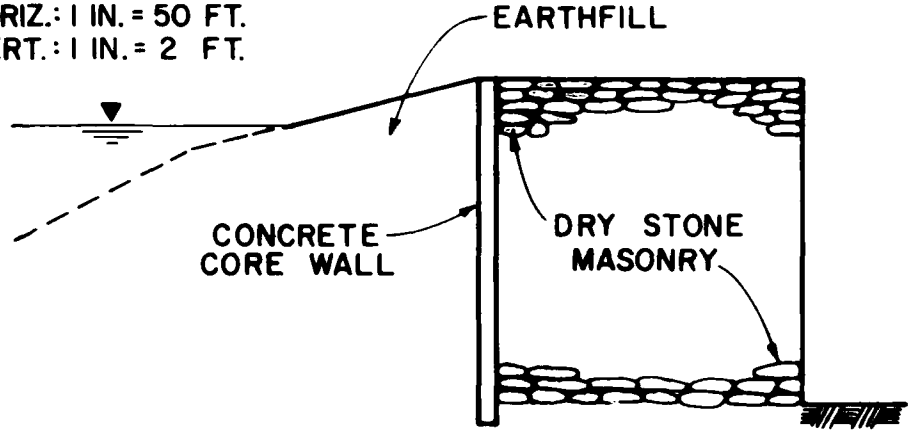
FIELD SKETCH

EXHIBIT A-1



TOP OF DAM – PROFILE

SCALE – HORIZ.: 1 IN. = 50 FT.
VERT.: 1 IN. = 2 FT.



EMBANKMENT SECTION

SCALE: 1 IN. = 10 FT.

PHASE I INSPECTION REPORT
NATIONAL DAM INSPECTION PROGRAM

ROBINSON POND DAM

LEISURE LIFE INC.

PROFILE AND SECTION

EXHIBIT A-2

APPENDIX B

CHECKLIST - ENGINEERING DATA

CHECK LIST
ENGINEERING DATA
DESIGN, CONSTRUCTION, OPERATION
PHASE 1

NAME OF DAM Robinson Dam
NDI ID# PA 00165
DER ID# 64-136

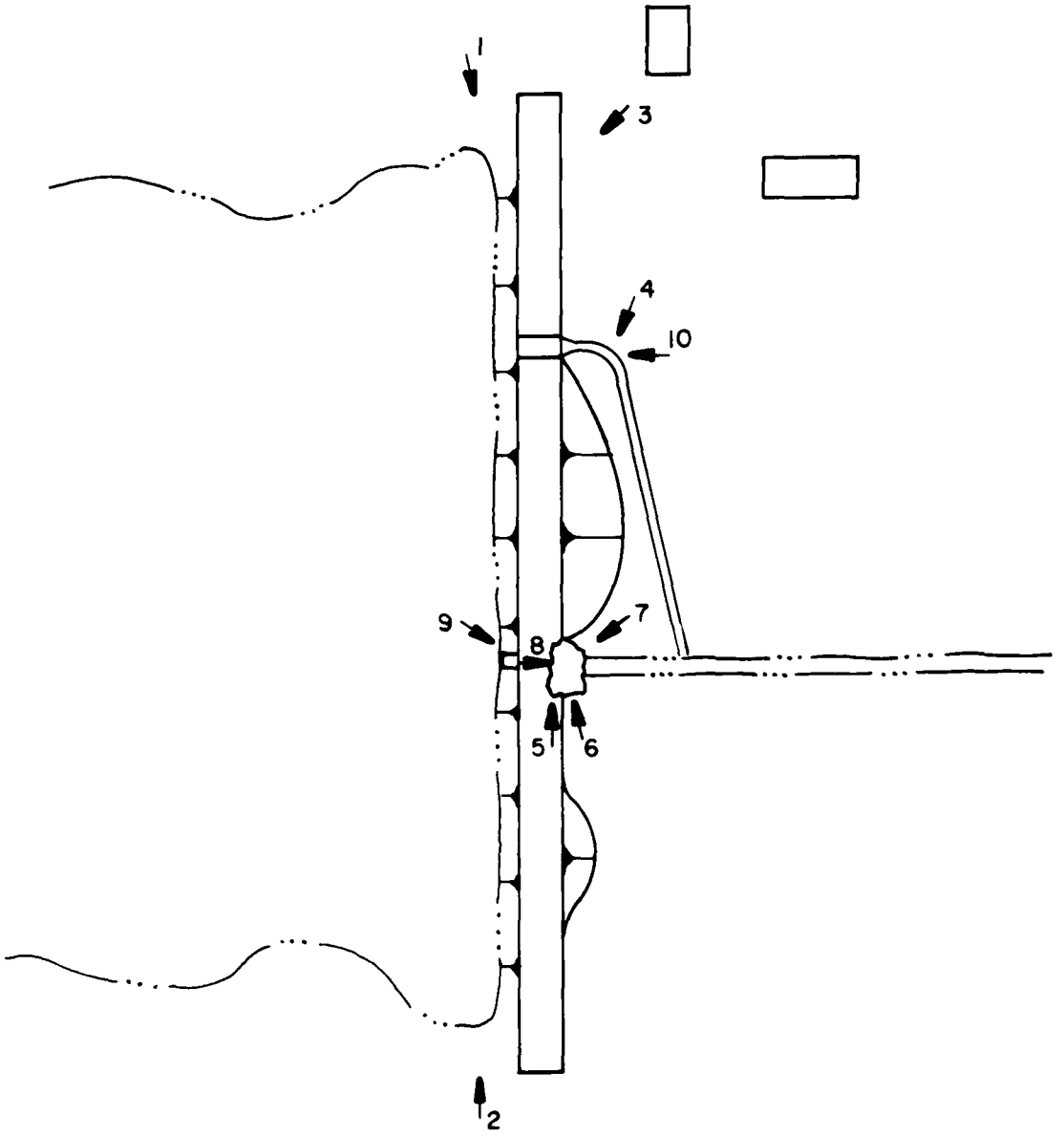
ITEM	REMARKS
As-Built Drawings	None
Regional Vicinity Map	U.S.G.S. Waymart Quadrangle - 7.5 minute See Plate 2, Appendix E.
Construction History	Original construction completed in 1938. No record of subsequent modifications.
Typical Sections of Dam	Rough Sketch Only; Not As-Built.
Outlets - Plan Details Constraints Discharge Ratings	None
Rainfall/Reservoir Records	None
Design Reports	Permit application report prepared by PennDER in August 1934 provides summary of design features.
Geology Reports	See Appendix F.

ITEM	REMARKS
Design Computations Hydrology & Hydraulics Dam Stability Seepage Studies	None
Materials Investigations Boring Records Laboratory Field	Memo in PennDER files indicated that test pits were dug during construction and showed foundation soil to be clay.
Post-Construction Surveys of Dam	None
Borrow Sources	None
Monitoring Systems	None
Modifications	Unknown
High Pool Records	None
Post-Construction Engineering Studies and Reports	None
Prior Accidents or Failure of Dam Description Reports	None reported

ITEM	REMARKS
Maintenance Operation Records	None
Spillway Plan	
Sections	Rough Sketch Only
Details	No Details
Operating Equipment Plans & Details	None
Specifications	None
Miscellaneous	None
Previous Inspections	1965 (PennDER) Noted spillway blockage Generally poor condition

APPENDIX C

PHOTOGRAPHS



← LOCATION AND ORIENTATION OF CAMERA

3 PHOTOGRAPH IDENTIFICATION NUMBER

NOT TO SCALE

PHASE I INSPECTION REPORT
NATIONAL DAM INSPECTION PROGRAM

ROBINSON POND DAM

LEISURE LIFE INC.

PHOTOGRAPH
LOCATION PLAN

EXHIBIT C-1

1. Crest, upstream face and abutments.

2. Upstream face and left abutment.

3. Downstream face near left abutment.

4. Downstream face between spillway and maximum section.

5. Colapsed section of downstream face.

6. Left side of collapsed section and downstream face.

7. Collapsed section of downstream face. Purpose of concrete encased pipe is unknown.

8. Downstream channel.

9. Drop inlet on upstream face.

10. Downstream end of spillway.
Note ends of concrete walls and broken
bottom slab approximately 2 1/2 feet below crest.

APPENDIX D

HYDROLOGY AND HYDRAULICS

PREFACE

The modified HEC-1 program is capable of performing two basic types of hydrologic analyses: 1) the evaluation of the overtopping potential of the dam; and 2) the estimation of the downstream hydrologic-hydraulic consequences resulting from assumed structural failures of the dam. Briefly, the computational procedures typically used in the dam overtopping analysis are as follows:

a. Development of an inflow hydrograph(s) to the reservoir.

b. Routing of the inflow hydrograph(s) through the reservoir to determine if the event(s) analyzed would overtop the dam.

c. Routing of the outflow hydrograph(s) from the reservoir to desired downstream locations. The results provide the peak discharge(s), time(s) of the peak discharge(s), and the maximum stage(s) of each routed hydrograph at the downstream end of each reach.

The evaluation of the hydrologic-hydraulic consequence resulting from an assumed structural failure (breach) of the dam is typically performed as shown below.

a. Development of an inflow hydrograph(s) to the reservoir.

b. Routing of the inflow hydrograph(s) through the reservoir.

c. Development of a failure hydrograph(s) based on specified breach criteria and normal reservoir outflow.

d. Routing of the failure hydrograph(s) to desired downstream locations. The results provide estimates of the peak discharge(s), time(s) to peak and maximum water surface elevations of failure hydrographs for each location.

HYDROLOGY & HYDRAULIC ANALYSIS
DATA BASE

NAME OF DAM: ROBINSON POND DAM

PROBABLE MAXIMUM PRECIPITATION (PMP) = 21.5 INCHES/24 HOURS (1)

DELAWARE RIVER BASIN

STATION	1	2	3
STATION DESCRIPTION	ROBINSON POND DAM		
DRAINAGE AREA (SQUARE MILES)	0.50		
CUMULATIVE DRAINAGE AREA (SQUARE MILES)	0.50		
ADJUSTMENT OF PMF FOR (1) DRAINAGE AREA LOCATION (%)	ZONE 1		
6 Hours	111		
12 Hours	123		
24 Hours	133		
48 Hours	142		
72 Hours	—		
SNYDER HYDROGRAPH PARAMETERS			
Zone (2)	1		
C_p (3)	0.45		
C^p (3)	1.23		
L^t (MILES) (4)	1.04		
L_{ca} (MILES (4)	0.52		
$tp = C_t (L \cdot L_{ca})$ 0.3 (HOURS)	1.02		
SPILLWAY DATA			
CREST LENGTH (FEET)	12		
FREEBOARD (FEET)	1.2		

(1) HYDROMETEOROLOGICAL REPORT - 33, U. S. Army Corps of Engineers, 1955.

(2) Hydrologic zone defined by Corps of Engineers, Baltimore District, For Determination of Snyder Coefficients (C_p and C_t).

(3) Snyder Coefficients

(4) L = Length of longest watercourse from dam to basin divide.
L_{ca} = Length of longest watercourse from dam to point opposite basin centroid.

BALTIMORE DISTRICT, CORPS OF ENGINEERS — PAGE

SUBJECT: SAFETY INSPECTION

COMPUTATIONS: JENSON POND — SHEET ___ OF 12 SHEETS

COMPUTED BY: JK — CHECKED BY: ___ — DATE: 8-8-80

DAM CLASSIFICATION

SIZE OF DAM - Small

HAZARD - High

REQUIRED SDF - 1/2 PMF to FULL PMF

DAM STATISTICS

HEIGHT OF DAM - 19.5 feet

STORAGE AT NORMAL POOL - 153 acre-feet

STORAGE AT TOP OF DAM (TOD) - 190 acre-feet

DRAINAGE AREA - 0.50 $mi.^2$

ELEVATIONS: *

TOP OF DAM (FIELD) - 1644.3

TOP OF DAM (DESIGN) - Unknown

NORMAL POOL - 1643.0

EMERGENCY SPILLWAY/CREST - 1643.0

C.M.P. INLET

UPSTREAM-TOP OF STOP LOGS - 1642.0

DOWNSTREAM OUTLET - UNOBSERVED

STREAMBED AT CENTERLINE OF DAM - 1625.0

* ALL ELEVATIONS ARE REFERENCED TO USGS QUAD SHEET - WAYMART, PA. GIVING DAM ELEV = 1643 ASSUMED TO BE AT SPILLWAY CREST.

NAB 1 FORM 232, 28 MAR 74

BALTIMORE DISTRICT, CORPS OF ENGINEERS PAGE

SUBJECT DAM SAFETY INSPECTION

COMPUTATIONS ROBINSON POND SHEET 2 OF 12 SHEETS

COMPUTED BY JPB CHECKED BY DATE 12-9-80

HYDROGRAPH PARAMETERS

RIVER BASIN - DELAWARE

ZONE - 1

SNYDER COEFFICIENTS:

C_p - 0.45

C_t - 1.23

* - LENGTH OF THE LONGEST WATERCOURSE : L = 1.04 miles

* - LENGTH OF THE LONGEST WATERCOURSE TO THE CENTROID OF THE BASIN : L_{CA} = 0.52 miles

t_p = SNYDERS BASIN LAG TIME TO PEAK IN HOURS

$$t_p = C_t (L L_{CA})^{0.3}$$

$$= 1.23 (1.04 (0.52))^{0.3}$$

$$= 1.02 \text{ hours}$$

RESERVOIR CAPACITY

- SURFACE AREA AT NORMAL POOL SPILLWAY CREST AT EL. 1643.0 = 30.1 acres
- SURFACE AREA AT ELEVATION 1660 = 65.8 acres

ASSUME CONICAL METHOD APPLIES TO FIND LOW POINT IN POOL, BELOW NORMAL POOL.

VOLUME OF NORMAL POOL = 153 AC.FT.

* - L & L_{CA} ARE MEASURED PARAMETERS, OFF USGS QUAD SHEET WAYMART, PA.

BADB FORM 1232, 28 MAR 74

BALTIMORE DISTRICT, CORPS OF ENGINEERS PAGE _____

SUBJECT DAM SAFETY INSPECTION

COMPUTATIONS ROBINSON POND SHEET 2 OF 2 SHEETS

COMPUTED BY MPG CHECKED BY _____ DATE 12-4-80

FROM CONICAL METHOD: $V = \frac{1}{3} A h$ $A = \pi r^2 = 30.1$

$\therefore h = \frac{3V}{A} = \frac{3(153 \text{ ac-ft})}{30.1 \text{ ac}} = 5.25$ ft.

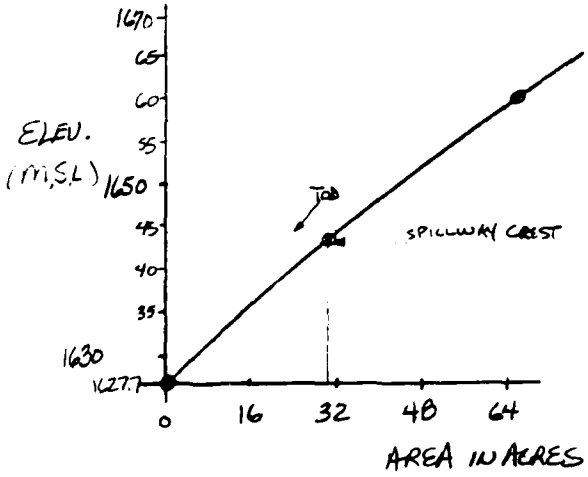
Say $h = 15.3$ ft.

$\therefore$ ELEVATION WHERE $V=0$ is $1643 - 15.3 = 1627.7$

KNOWN DATA:

EL. MSL	AREA (ACRES)
1627.7	0
1643.0	30.1
1660.0	65.8

ELEVATION - AREA CURVE



NOW, FOR FLOOD ROUTING PURPOSES, ASSUME THAT AVERAGE END AREA METHOD IS SUITABLE TO ELEVATIONS ABOVE SPILLWAY CREST - 1643.0.

$$\Delta V = \left(\frac{A_1 + A_2}{2}\right) \Delta H$$

ELEVATION - STORAGE TABLE

ELEVATION (MSL)	AREA (ACRES)	$\Delta V = \left(\frac{A_1 + A_2}{2}\right) \Delta H$ (ACRES)	CUMULATIVE VOLUME (AC-FT)	
1627.7	0	(Conical Method)	0	
1643.0	30.1	373	153.0	150
1644.2 (TOP)	32.0	219.8	190.3	190
1650.0	43.8	249.5	409.6	410
1655.0	56.0	304.5	659.1	660
1660.0	65.8		963.6	960

THIS DATA WILL BE INPUT ON #S & #E CARDS.

BALTIMORE DISTRICT, CORPS OF ENGINEERS PAGE

SUBJECT

COMPUTATIONS SHEET

COMPUTED BY CHECKED BY DATE

PMF CALCULATIONS:

APPROXIMATE RAINFALL INDEX = 22.5 INCHES *
CORRESPONDING TO A DURATION OF 24 HOURS
AND A DRAINAGE AREA OF 200 SQUARE MILES

- ZONE 6 HYDROMET #33

- ASSUME VALUES CORRESPONDING TO A 200 MI² AREA MAY BE APPLIED TO THE 0.5 MI² BASIN

DURATION HRS.	PERCENT OF INDEX RAINFALL
6	[illegible]
12	[illegible]
24	135
48	142

NOTE: HOP BROOK FACTOR ... COMPUTED BY THE HEC-1 DB PROGRAM FOR A DRAINAGE AREA LESS THAN 10 MILES SQUARE THE ADJUSTMENT FACTOR = 0.80. (THE ADJUSTMENT FOR BASIN SHAPE ... THE LIKELIHOOD OF A SEVERE STORM CENTERING OVER A SMALL BASIN)

SDF: BASED ON THE SMALL HEIGHT AND STORAGE OF THE DAM, THE SDF SELECTED CONSIDERING THE HAZARD CATAGORY WAS THE 1/2 PMF. THIS IS IN ACCORDANCE WITH THE GUIDENCE PROVIDED.

∴ USE SDF = 1/2 PMF

* RAINFALL INDEX FROM HYDROMET NO. 33 - ... PMF EAST OF 105th MERIDIAN. APPLICABLE TO ... BASIN.

NAD8 FORM 232, 28 MAR 74

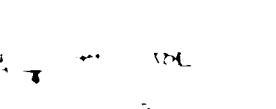
ENGINEERS

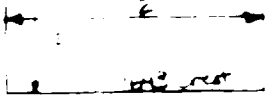
PAGE

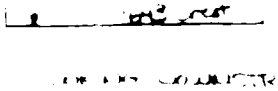
SHEET OF SHEETS

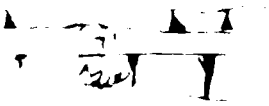
CHECKED BY DATE

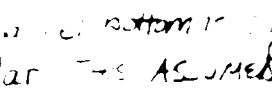
EXHIBIT 1

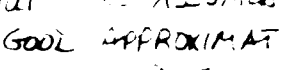












	100
	630
	420
	2400

	0
	45
	2400

BALTIMORE DISTRICT, CORPS OF ENGINEERS PAGE

SUBJECT DAM SAFETY INSPECTION

COMPUTATIONS ROBINSON POND SHEET 6 OF 12 SHEETS

COMPUTED BY JPB CHECKED BY DATE 12-10-80

EMBANKMENT RATING CURVE:

TH ANALYSIS ASSUMES THAT THE EMBANKMENT BEHAVES AS A BROAD CRESTED WEIR IF OVERTOPPING OCCURS. THE DISCHARGE CAN BE ESTIMATED BY:

$$Q = CL_1H_w^{3/2}$$

WHERE: Q = DISCHARGE OVER EMBANKMENT, IN CFS

L_1 = LENGTH OF EMBANKMENT, AVERAGE, IN FT

H_w = WEIGHTED HEAD IN FEET, AVERAGE FLOW AREA WEIGHTED ABOVE LOW POINT OF DAM

C = COEFFICIENT OF DISCHARGE

LENGTH OF EMBANKMENT INUNDATED VS. RESERVOIR ELEVATION:

RESERVOIR ELEVATION (MSL)	EMBANKMENT LENGTH (FT)
1644.2	0 ft.
1644.5	180 ft.
1645.0	260 ft.
1646.0 *	ENTIRE LENGTH OF 328ft
1650.0 *	328ft
1655.0 *	328ft
1660.0 *	328ft

* AT THESE ELEVATIONS ASSUME L = LENGTH OF EMBANKM

$\therefore Q = CLH^{3/2}$ gives conservative results

NADB FORM 232, 28 MAR 74

BALTIMORE DISTRICT, CORPS OF ENGINEERS PAGE

SUBJECT DAM SAFETY INSPECTION

COMPUTATIONS ROBINSON POND SHEET 7 OF 12 SHEETS

COMPUTED BY MPB CHECKED BY DATE 12-10-80

EMBANKMENT RATING TABLE:

RESERVOIR ELEVATION (Ft)	L_1 (Ft)	L_2 (Ft)	INCREMENTAL HEAD H_c (Ft)	① INCREMENTAL FLOW AREA A_c (Ft^2)	TOTAL FLOW AREA (A_T)	② WEIGHTED HEAD (Ft)	③ Q (CFS)
1644.2	0	–	–	–	–	–	–
1644.5	180	0	0.3	27	27	0.15	30
1645.0	260	180	0.5	110	137	0.53	290
1646.0	328	260	1.0	294	431	1.30	1390
1650.0	328	328	4.0	1312	1743	5.30	11400
1655.0	328	328	5.0	1640	3383	10.30	35600
1660.0	328	328	5.0	1640	5023	15.30	55900

$C = 2.85$

① $A_c = H_c[(L_1 + L_2)/2]$

② $H_w = \frac{A_T}{L_1}$

③ $Q = CL_1 H_w^{3/2}$

TOTAL FACILITY RATING CURVE

$Q_{TOTAL} = Q_{SPILL} + Q_{EMB}$

	RESERVOIR ELEVATION FT (T)	$Q_{SPILLWAY}$ (CFS)	Q_{EMBANK} (CFS)	Q_{TOTAL} (CFS)
SPILLWAY CREST LOW T.O.A	~~1643~~	0	0	0
	~~1643.5~~	12	0	~~12~~
	~~1644.2~~	45	0	~~45~~
	1644.5	60	30	90
	1645.0	100	290	390
	1646.0	180	1390	1570
	1650.0	630	11400	12030
	1655.0	1420	35600	37000
	1660.0	2400	55900	58300

ABOVE VALUES TO BE INPUT ON Y4 & Y5 CARD.

NAOB FORM 232, 28 MAR 74

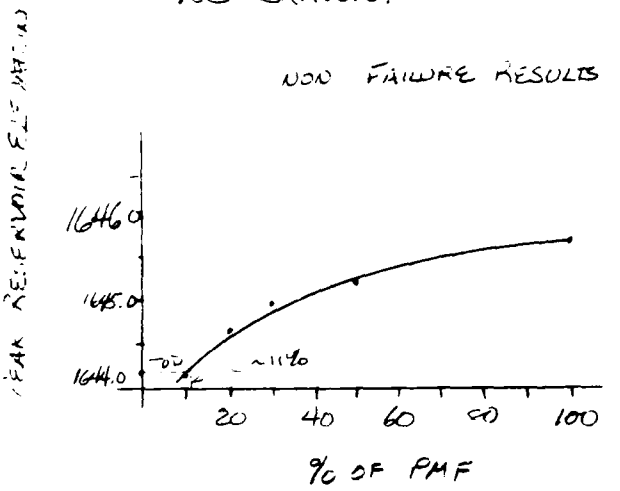
BALTIMORE DISTRICT, CORPS OF ENGINEERS — PAGE

SUBJECT DAM SAFETY ANALYSIS

COMPUTATIONS ROBINSON POND — SHEET 8 OF 12 SHEETS

COMPUTED BY JPK — CHECKED BY — DATE 12-10-80

FROM THE OVERTOPPING ANALYSIS THE FOLLOWING CURVE CAN BE DRAWN.



SINCE LOW POINT TOP OF DAM IS 1644.20

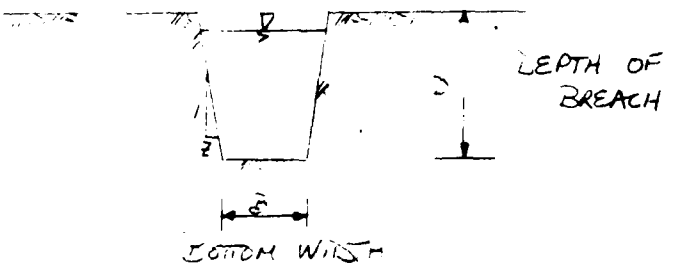
∴ AT TOP OF DAM ELEVATION THE DAM & SPILLWAY CAN PASS UP TO 11% OF THE PMF.

% PMF WITHOUT OVERTOPPING

NOTE: SINCE THIS DAM IS A HIGH HAZARD, AND IT IS FELT THAT THE 50% PMF WOULD CAUSE FAILURE A BREACH ANALYSIS IS REQUIRED. THE BREACH ANALYSIS WOULD EXAMINE THE SIGNIFICANCE OF FAILURE AND NON-FAILURE CONDITIONS FOR ~ 25% PMF.

BREACH ANALYSIS:

TYPICAL BREACH SECTION



NADR FORM 2312, 28 MAR 74

BALTIMORE DISTRICT CORPS OF ENGINEERS PAGE

SUBJECT DAM SAFETY ANALYSIS

COMPUTATIONS ROBINSON POND SHEET 7 OF 2 SHEETS

COMPUTED BY JMC CHECKED BY DATE 5-12-80

HEC1DB INPUT PARAMETERS FOR BREACH ANALYSIS

SINCE LAM HAS CORE WALL AND STONE EMBANKMENT ASSUME BREACH OCCURS WHEN WATER SURFACE ELEVATION REACHES 1644.7 OR ½ FOOT ABOVE TOP

PLAN	BREACH BOTTOM WIDTH (FT)	FULL BREACH DEPTH (FT)	SIDE SLOPES	TOTAL BREACH TIME (HRS)
1	— Non failure conditions —			
2	50	14.2	0.5H:1V	0.33
3	50	14.2	0.5H:1V	1.00
4	50	14.2	0.5H:1V	2.00

NOTE:
TO REACH A WATER SURFACE ELEVATION ½ FOOT ABOVE TOP ROUTE 25% PMF FOR BREACH ANALYSIS

HEC1-DB OUTPUT

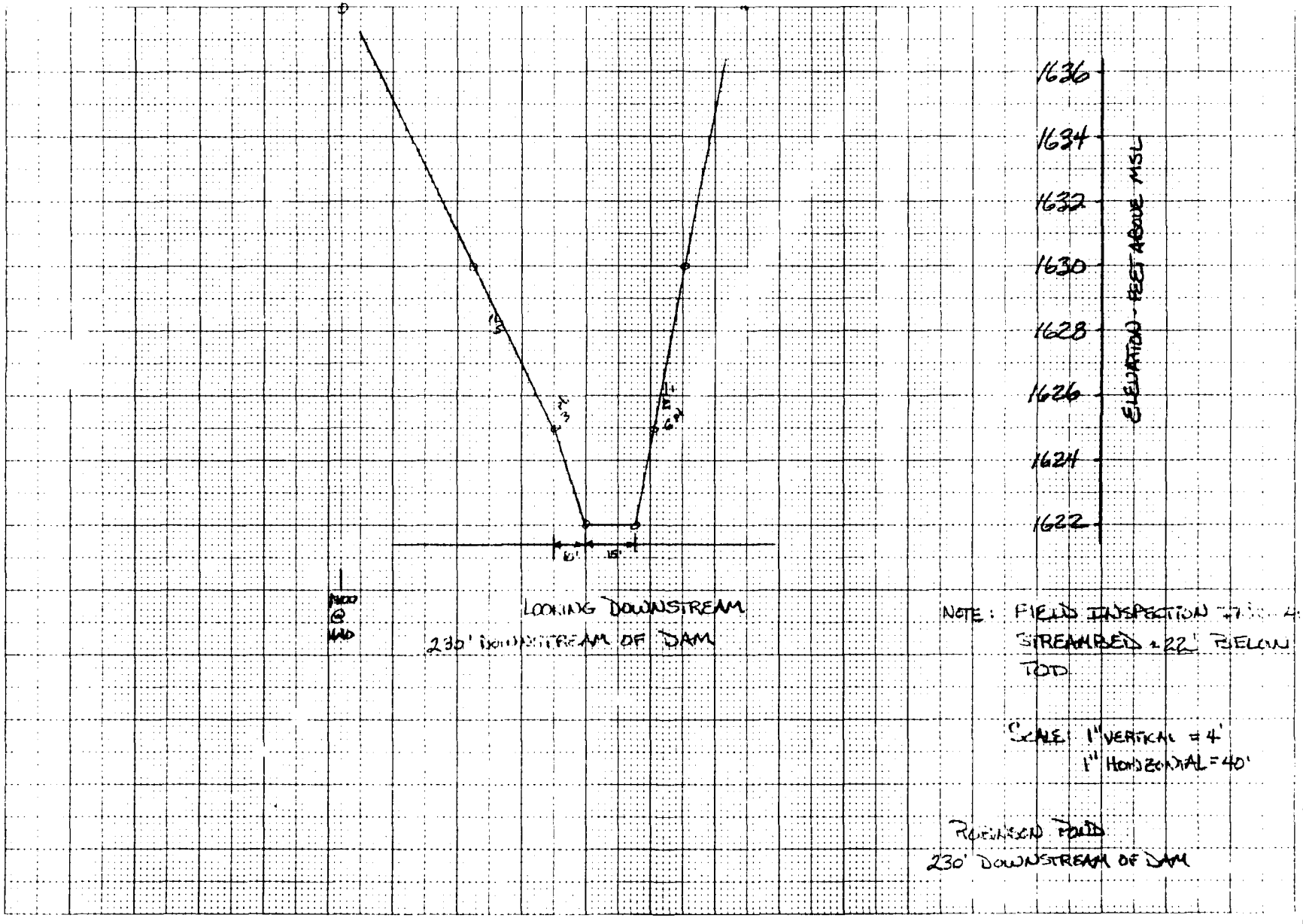
RESULTS OF LAM BREACH ANALYSIS

AS NOTED ABOVE - PLAN 1 IS FOR NON FAILURE CONDITIONS

PLAN NUMBER	MAXIMUM OUTFLOW OVER DAM AND/OR THRU BREACH (CFS)	DOWNSTREAM DAMAGE CENTER #1 STAGE (MSL)	DOWNSTREAM DAMAGE CENTER #1 FLOW (CFS)	DOWNSTREAM DAMAGE CENTER #2 STAGE (MSL)	DOWNSTREAM DAMAGE CENTER #2 FLOW (CFS)
1	260	1623.6	260	1403.7	260
2	7580	1633.4	7160	1408.1	4360
3	3400	1630.0	2890	1407.2	2535
4	2070	1628.6	1876	1406.4	1620

DOWNSTREAM DAMAGE CENTER #1 - FIRST FLOOR OF HOME ~EL. 1623
DOWNSTREAM DAMAGE CENTER #2 - FIRST FLOOR OF HOME ~EL. 1414

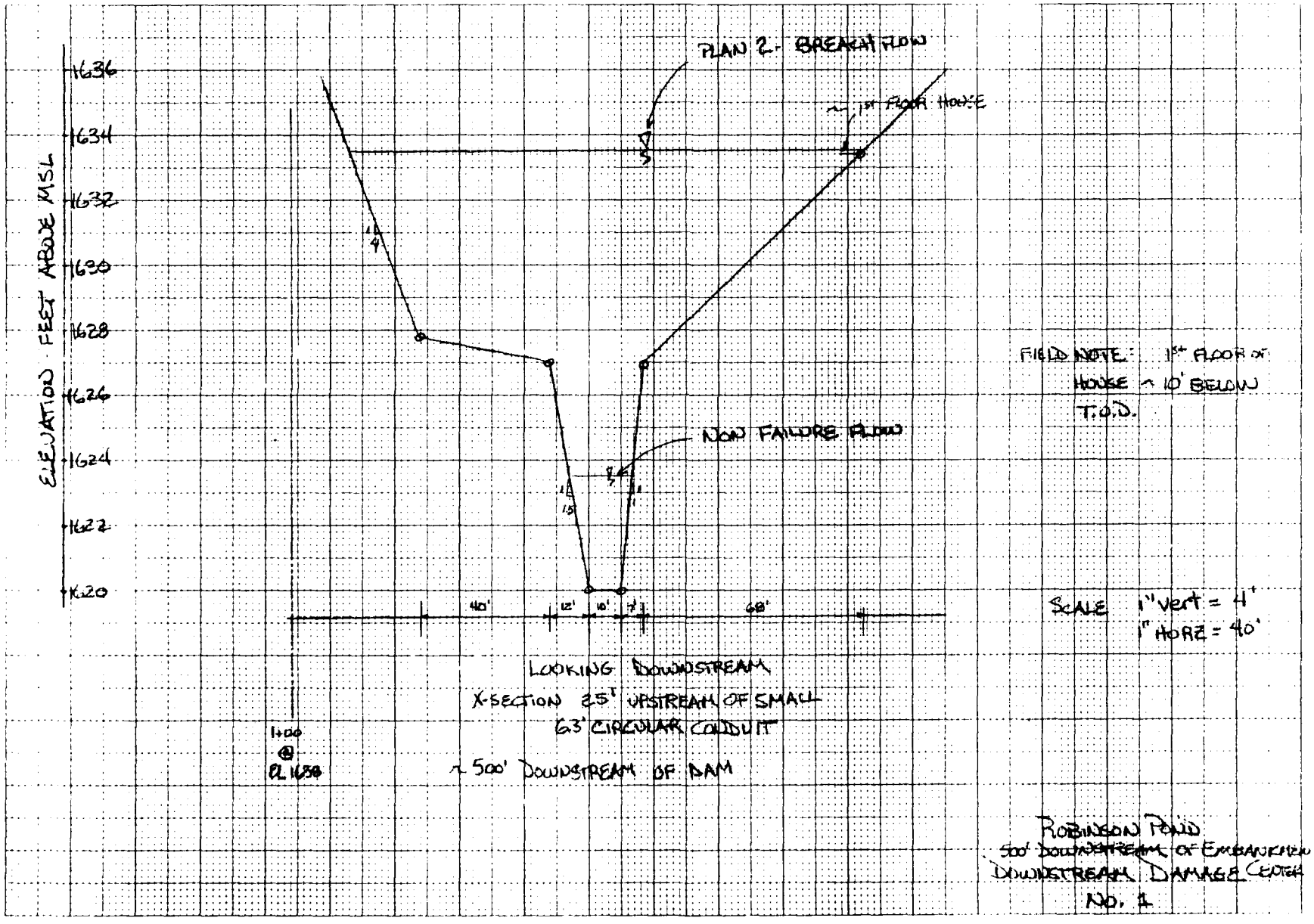
NAOB FORM 232, 28 MAR 74



NOTE: FIELD INSPECTION [illegible]
STREAMBED ± 22' BELOW TOD

SCALE: 1" VERTICAL = 4'
1" HORIZONTAL = 40'

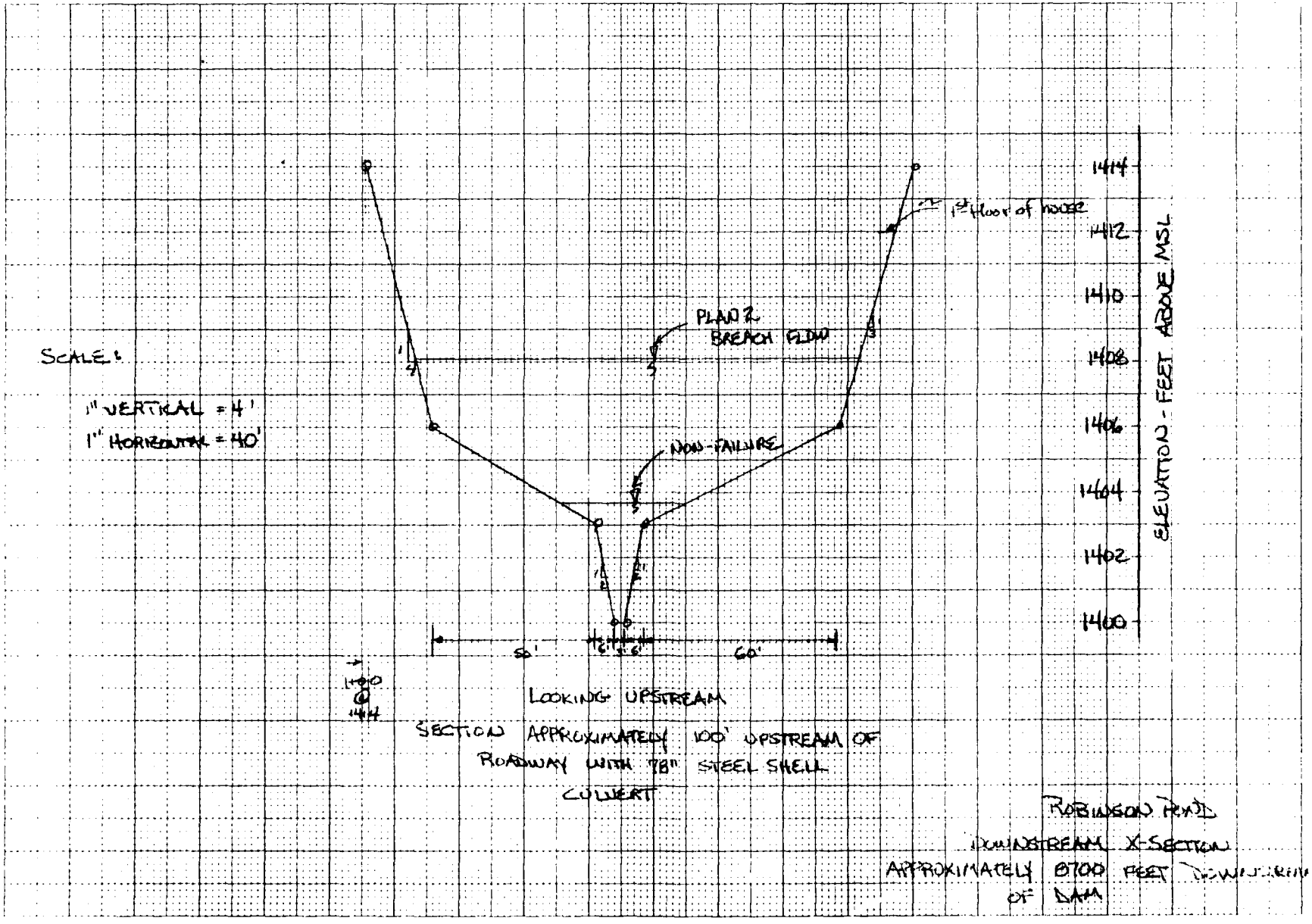
REVISED PLOT
230' DOWNSTREAM OF DAM



Sheet 11/2

NO. 340 · 10 × 10 DIETZGEN GRAPH PAPER
10 X 10 PER HALF INCH

DIETZGEN CORPORATION
MADE IN U.S.A.



SECTION APPROXIMATELY 100' UPSTREAM OF ROADWAY WITH 78" STEEL SHELL CULVERT

ROBINSON ROAD
DOWNSTREAM X-SECTION
APPROXIMATELY 8700 FEET DOWNSTREAM OF DAM

C-D

Sheet 12/12

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1#############################
 FLOOD HYDROGRAPH PACKAGE (HEC-1)
 DAM SAFETY VERSION     JULY 1978
   LAST MODIFICATION  01 APR 80
 #############################
    1              A1     ROBINSON DAM   DER NO. 90-64-136
    2              A2   DAM SAFTEY INSPECTION PROGRAM     12-9-80
    3              A3    OVERTOPPING ANALYSIS    *** PRELIMINARY   ***
    4              B    144       0      20       0       0       0       0       0       0       0
    5              B1     5       0       0       0       0       0       0       0       0       0
    6              J      1       5       1
    7              J1  0.10    0.20    0.30    0.50    1.00
    8              K      0       1       0       0       0       0       1       0       0       0
    9              K1   RUNOFF FROM DRAINAGE AREA ABOVE ROBINSON DAM
   10              M      1       1    0.50       0    0.50       0       0       0       1       0
   11              P      0    21.5     111     123     133     142
   12              T      0       0       0       0       0       0     1.0    0.05       0       0
   13              W   1.02    0.45
   14              X   -1.5   -0.05       2
   15              K      1       1       0       0       0       0       1       0       0       0
   16              K1   ROUTING %PMF'S THRU ROBINSON DAM AND SPILLWAY
   17              Y      0       0       0       1       1       0       0       0       0       0
   18              Y1     1       0       0       0       0       0   -1643      -1       0       0
   19              Y41643.0  1643.5  1644.2  1644.5  1645.0  1646.0  1650.0  1655.0
   20              Y5     0    12.0    45.0    90.0   390.0  1570.0 12030.0 37000.0
   21              $S     0     150     190     410     660     960
   22              $E1627.7  1643.0  1644.2  1650.0  1655.0  1660.0
   23              $$1643.0
   24              $D1644.2
   25              K      1       2       0       0       0       0       1       0       0       0
   26              K1    DOWNSTREAM X-SECTION 230 FEET FROM DAM
   27              Y      0       0       0       1
   28              Y1     1       0       0       0       0       0      -1
   29              Y6  0.07    0.05    0.07    1622    1638     230  0.0090       0       0       0
   30              Y7   100    1638     142    1630     162    1625     175    1622     190    1622
   31              Y7   197    1625     207    1630     225    1638
   32              K      1       3       0       0       0       0       1       0       0       0
   33              K1     ROUTE THRU THE   1ST DOWNSTREAM DAMAGE CENTER
   34              Y      0       0       0       1
   35              Y1     1       0       0       0       0       0      -1
   36              Y6  0.07    0.05    0.07    1620    1638     470  0.0090       0       0       0
   37              Y7   100    1638     140  1627.8     180    1627     192    1620     202    1620
   38              Y7   210    1627     277  1633.6     323    1638
   39              K      1       4       0       0       0       0       1       0       0       0
   40              K1      ROUTE FLOW THRU  2ND DOWNSTREAM  DAMAGE CENTER
   41              Y      0       0       0       1
   42              Y1     1       0       0       0       0       0      -1
   43              Y6  0.07    0.05    0.07    1400    1414    8200   0.027       0       0       0
   44              Y7   100    1414     120    1406     170    1403     175    1400     178    1400
   45              Y7   185    1405     246    1406     270    1414
   46              K     99
1                          PREVIEW OF SEQUENCE OF STREAM NETWORK CALCULATIONS

                                  RUNOFF HYDROGRAPH AT          1
                                  ROUTE HYDROGRAPH TO           1
                                  ROUTE HYDROGRAPH TO           2
                                  ROUTE HYDROGRAPH TO           3
                                  ROUTE HYDROGRAPH TO           4
                                  END OF NETWORK


1#############################
 FLOOD HYDROGRAPH PACKAGE (HEC-1)
 DAM SAFETY VERSION     JULY 1978
   LAST MODIFICATION  01 APR 80
 #############################
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RUN DATE= 81/03/04.
TIME= 04.26.49.

ROBINSON DAM DER NO. 90-64-136
DAM SAFTEY INSPECTION PROGRAM 12-9-80
OVERTOPPING ANALYSIS *** PRELIMINARY ***

JOB SPECIFICATION

NO	NHR	NMIN	IDAY	IHR	IMIN	METRC	IPLT	IPRT	NSTAN
144	0	20	0	0	0	0	0	0	0

JOPER	NWT	LROPT	TRACE
5	0	0	0

MULTI-PLAN ANALYSES TO BE PERFORMED
NPLAN= 1 NRTIO= 5 LRTIO= 1
RTIOS= .10 .20 .30 .50 1.00

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SUB-AREA RUNOFF COMPUTATION

RUNOFF FROM DRAINAGE AREA ABOVE ROBINSON DAM

ISTAQ	ICOMP	IECON	ITAPE	JPLT	JPRT	INAME	ISTAGE	IAUTO
1	0	0	0	0	0	1	0	0

HYDROGRAPH DATA

IHYDG	IUHG	TAREA	SNAP	TRSDA	TRSPC	RATIO	ISNOW	ISAME	LOCAL
1	1	.50	0.00	.50	0.00	0.000	0	1	0

PRECIP DATA

SPFE	PMS	R6	R12	R24	R48	R72	R96
0.00	21.50	111.00	123.00	133.00	142.00	0.00	0.00

TRSPC COMPUTED BY THE PROGRAM IS .800

LOSS DATA

LROPT	STRKR	DLTKR	RTIOL	ERAIN	STRKS	RTIOK	STRTL	CNSTL	ALSMX	RTIMP
0	0.00	0.00	1.00	0.00	0.00	1.00	1.00	.05	0.00	0.00

UNIT HYDROGRAPH DATA
TP= 1.02 CP= .45 NTA= 0

RECESSION DATA
STRTQ= -1.50 QRCSN= -.05 RTIOR= 2.00
APPROXIMATE CLARK COEFFICIENTS FROM GIVEN SNYDER CP AND TP ARE TC= 3.33 AND R= 4.76 INTERVALS

UNIT HYDROGRAPH 27 END-OF-PERIOD ORDINATES, LAG= 1.03 HOURS, CP= .45 VOL= 1.00

21.	76.	128.	137.	115.	93.	75.	61.	49.	40.
32.	26.	21.	17.	14.	11.	9.	7.	6.	5.
4.	3.	3.	2.	2.	1.	1.			

ROBINSON DAM
OVERTOPPING ANALYSIS
Page 2/4

********** ********** ********** ********** **********

HYDROGRAPH ROUTING

ROUTING %PMF'S THRU ROBINSON DAM AND SPILLWAY

ISTAQ	ICOMP	IECON	ITAPE	JPLT	JPRT	INAME	ISTAGE	IAUTO
1	1	0	0	0	0	1	0	0

ROUTING DATA

QLOSS	CLOSS	AVG	IRES	ISAME	IOPT	IPMP	LSTR
0.0	0.000	0.00	1	1	0	0	0

NSTPS	NSTDL	LAG	AMSKK	X	TSK	STORA	ISPRAT
1	0	0	0.000	0.000	0.000	-1643.	-1

STAGE	1643.00	1643.50	1644.20	1644.50	1645.00	1646.00	1650.00	1655.00
FLOW	0.00	12.00	45.00	90.00	390.00	1570.00	12030.00	37000.00
CAPACITY=	0.	150.	190.	410.	660.	960.		
ELEVATION=	1628.	1643.	1644.	1650.	1655.	1660.		

CREL	SPWID	COQW	EXPW	ELEVL	COQL	CAREA	EXPL
1643.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0

DAM DATA

TOPEL	COQD	EXPD	DAMWID
1644.2	0.0	0.0	0.

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1

PEAK FLOW AND STORAGE (END OF PERIOD) SUMMARY FOR MULTIPLE PLAN-RATIO ECONOMIC COMPUTATIONS
FLOWS IN CUBIC FEET PER SECOND (CUBIC METERS PER SECOND)
AREA IN SQUARE MILES (SQUARE KILOMETERS)

OPERATION	STATION	AREA	PLAN	RATIOS APPLIED TO FLOWS RATIO 1 .10	RATIO 2 .20	RATIO 3 .30	RATIO 4 .50	RATIO 5 1.00
HYDROGRAPH AT	1	.50	1	138.	276.	414.	690.	1380.
	(	1.29)	(	3.91)(	7.81)(	11.72)(	19.54)(	39.07)(
ROUTED TO	1	.50	1	42.	188.	332.	638.	1303.
	(	1.29)	(	1.20)(	5.32)(	9.41)(	18.06)(	36.88)(
ROUTED TO	2	.50	1	42.	188.	333.	638.	1302.
	(	1.29)	(	1.20)(	5.34)(	9.43)(	18.08)(	36.86)(
ROUTED TO	3	.50	1	42.	188.	333.	639.	1300.
	(	1.29)	(	1.20)(	5.32)(	9.44)(	18.09)(	36.82)(
ROUTED TO	4	.50	1	42.	185.	326.	617.	1266.
	(	1.29)	(	1.19)(	5.23)(	9.23)(	17.48)(	35.86)(

ROBINSON DAM
OVERTOPPING ANALYSIS

1

SUMMARY OF DAM SAFETY ANALYSIS

PLAN 1 .....

	INITIAL VALUE	SPILLWAY CREST	TOP OF DAM
ELEVATION	1643.00	1643.00	1644.20
STORAGE	150.	150.	190.
OUTFLOW	0.	0.	45.

RATIO OF PMF	MAXIMUM RESERVOIR W.S.ELEV	MAXIMUM DEPTH OVER DAM	MAXIMUM STORAGE AC-FT	MAXIMUM OUTFLOW CFS	DURATION OVER TOP HOURS	TIME OF MAX OUTFLOW HOURS	TIME OF FAILURE HOURS
.10	1644.14	0.00	188.	42.	0.00	44.00	0.00
.20	1644.66	.46	208.	188.	7.67	42.33	0.00
.30	1644.90	.70	217.	332.	8.67	41.67	0.00
.50	1645.21	1.01	228.	638.	9.67	41.00	0.00
1.00	1645.77	1.57	250.	1303.	11.33	41.00	0.00

PLAN 1 STATION 2

RATIO	MAXIMUM FLOW,CFS	MAXIMUM STAGE,FT	TIME HOURS
.10	42.	1622.9	44.00
.20	188.	1624.1	42.33
.30	333.	1624.9	41.67
.50	638.	1625.9	41.00
1.00	1302.	1627.5	41.00

PLAN 1 STATION 3

RATIO	MAXIMUM FLOW,CFS	MAXIMUM STAGE,FT	TIME HOURS
.10	42.	1621.2	44.00
.20	188.	1622.9	42.33
.30	333.	1624.0	41.67
.50	639.	1625.6	41.00
1.00	1300.	1627.7	41.00

PLAN 1 STATION 4

RATIO	MAXIMUM FLOW,CFS	MAXIMUM STAGE,FT	TIME HOURS
.10	42.	1401.6	44.33
.20	185.	1403.2	42.67
.30	326.	1404.0	42.00
.50	617.	1405.0	41.67
1.00	1266.	1406.1	41.33

1**********
FLOOD HYDROGRAPH PACKAGE (HEC-1)
DAM SAFETY VERSION JULY 1978
LAST MODIFICATION 01 APR 80
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ROBINSON DAM
OVERTOPPING ANALYSIS

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1*******************************
 FLOOD HYDROGRAPH PACKAGE (HEC-1)
 DAM SAFETY VERSION     JULY 1978
   LAST MODIFICATION  01 APR 80
 *******************************
    1              A1     ROBINSON DAM   DER NO. 90-64-136
    2              A2   DAM SAFTEY INSPECTION PROGRAM     12-9-80
    3              A3    BREACH ANALYSIS    *** PRELIMINARY   ***
    4              B   144       0      20       0       0       0       0       0       0       0
    5              B1    5       0       0       0       0       0       0       0       0       0
    6              J     4       1       1
    7              J1  0.25
    8              K     0       1       0       0       0       0       1       0       0       0
    9              K1   RUNOFF FROM DRAINAGE AREA ABOVE ROBINSON DAM
   10              M     1       1    0.50       0    0.50       0       0       0       1       0
   11              P     0    21.5     111     123     133     142
   12              T     0       0       0       0       0       0     1.0    0.05       0       0
   13              W  1.02    0.45
   14              X  -1.5   -0.05       2
   15              K     1       1       0       0       0       0       1       0       0       0
   16              K1   ROUTING %PMF'S THRU ROBINSON DAM AND SPILLWAY
   17              Y     0       0       0       1       1       0       0       0       0       0
   18              Y1    1       0       0       0       0       0   -1643      -1       0       0
   19              Y41643.0  1643.5  1644.2  1644.5  1645.0  1646.0  1650.0  1655.0
   20              Y5    0    12.0    45.0    90.0   390.0  1570.0 12030.0 37000.0
   21              $S    0     150     190     410     660     960
   22              $E1627.7  1643.0  1644.2  1650.0  1655.0  1660.0
   23              $$1643.0
   24              $D1644.2
   25              $B   50     0.5    1630    0.33    1643    1700
   26              $B   50     0.5    1630    0.33    1643  1644.7
   27              $B   50     0.5    1630    1.00    1643  1644.7
   28              $B   50     0.5    1630    2.00    1643  1644.7
   29              K     1       2       0       0       0       0       1       0       0       0
   30              K1    DOWNSTREAM X-SECTION  30 FEET FROM DAM
   31              Y     0       0       0       1       1
   32              Y1    1       0       0       0       0       0       0
   33              Y6 0.07    0.05    0.07    1622    1640     230   0.009       0       0       0
   34              Y7  100    1638     142    1630     162    1625     175    1622     190    1622
   35              Y7  197    1625     207    1630     225    1640
   36              K     1       3       0       0       0       0       1       0       0       0
   37              K1     ROUTE THRU THE   1ST DOWNSTREAM DAMAGE CENTER
   38              Y     0       0       0       1       1
   39              Y1    1       0       0       0       0       0       0
   40              Y6 0.07    0.05    0.07    1620    1638     270  0.0090       0       0       0
   41              Y7  100    1638     140  1627.8     180    1627     192    1620     202    1620
   42              Y7  210    1627     277  1633.6     323    1638
   43              K     1       4       0       0       0       0       1       0       0       0
   44              K1      ROUTE FLOW THRU  2ND DOWNSTREAM  DAMAGE CENTER
   45              Y     0       0       0       1       1
   46              Y1    1       0       0       0       0       0       0
   47              Y6 0.07    0.05    0.07    1400    1414    8200   0.027       0       0       0
   48              Y7  100    1414     120    1406     170    1403     175    1400     178    1400
   49              Y7  185    1405     246    1406     270    1414
   50              K    99
1                          PREVIEW OF SEQUENCE OF STREAM NETWORK CALCULATIONS

                                RUNOFF HYDROGRAPH AT          1
                                ROUTE HYDROGRAPH TO           1
                                ROUTE HYDROGRAPH TO           2
                                ROUTE HYDROGRAPH TO           3
                                ROUTE HYDROGRAPH TO           4
                                END OF NETWORK


1*******************************
 FLOOD HYDROGRAPH PACKAGE (HEC-1)
 DAM SAFETY VERSION     JULY 1978
   LAST MODIFICATION  01 APR 80
 *******************************
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ROBINSON DAM
BREACH ANALYSIS

DAM BREACH DATA

BRWID	Z	ELBM	TFAIL	WSEL	FAILEL
50.	.50	1630.00	.33	1643.00	1700.00

STATION 1, PLAN : RATIO

DAM BREACH DATA

BRWID	Z	ELBM	TFAIL	WSEL	FAILEL
50.	.50	1630.00	.33	1643.00	1644.70

STATION 1, PLAN 2, RATIO 1

DAM BREACH DATA

BRWID	Z	ELBM	TFAIL	WSEL	FAILEL
50.	.50	1630.00	1.00	1643.00	1644.70

STATION 1, PLAN 3, RATIO 1

DAM BREACH DATA

BRWID	Z	ELBM	TFAIL	WSEL	FAILEL
50.	.50	1630.00	2.00	1643.00	1644.70

STATION 1, PLAN 4, RATIO 1

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HYDROGRAPH ROUTING

DOWNSTREAM X-SECTION 30 FEET FROM DAM

ISTAQ	ICOMP	IECON	ITAPE	JPLT	JPRT	INAME	ISTAGE	IAUTO
2	1	0	0	0	0	1	0	0

ALL PLANS HAVE SAME ROUTING DATA

QLOSS	CLOSS	AVG	IRES	ISAME	IOPT	IPMP	LSTR
0.0	0.000	0.00	1	1	0	0	0

NSTPS	NSTDL	LAG	AMSKK	X	TSK	STORA	ISPRAT
1	0	0	0.000	0.000	0.000	0.	0

NORMAL DEPTH CHANNEL ROUTING

QN(1)	QN(2)	QN(3)	ELMVT	ELMAX	RLNTH	SEL
.0700	.0500	.0700	1622.0	1640.0	230.	.00900

CROSS SECTION COORDINATES--STA,ELEV,STA,ELEV--ETC
100.00 1638.00 142.00 1630.00 162.00 1625.00 175.00 1622.00 190.00 1622.00
197.00 1625.00 207.00 1630.00 225.00 1640.00

STORAGE	0.00	.09	.21	.37	.55	.76	1.01	1.28	1.57	1.90
	2.26	2.66	3.08	3.54	4.04	4.57	5.13	5.72	6.33	6.95
OUTFLOW	0.00	41.76	144.95	311.70	585.78	946.96	1391.00	1920.72	2539.10	3246.37
	4048.92	4953.91	5965.64	7088.39	8326.36	9683.71	11164.53	12787.70	14659.21	16657.95
STAGE	1622.00	1622.95	1623.89	1624.84	1625.79	1626.74	1627.68	1628.63	1629.58	1630.53
	1631.47	1632.42	1633.37	1634.32	1635.26	1636.21	1637.16	1638.11	1639.05	1640.00

ROBINSON DAM
BREACH ANALYSIS

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HYDROGRAPH ROUTING

ROUTE THRU THE 1ST DOWNSTREAM DAMAGE CENTER

ISTAQ	ICOMP	IECON	ITAPE	JPLT	JPRT	INAME	ISTAGE	IAUTO
3	1	0	0	0	0	1	0	0

ALL PLANS HAVE SAME ROUTING DATA

QLOSS	CLOSS	AVG	IRES	ISAME	IOPT	IPMP	LSTR
0.0	0.000	0.00	1	1	0	0	0

NSTPS	NSTDL	LAG	AMSKK	X	TSK	STORA	ISPRAT
1	0	0	0.000	0.000	0.000	0.	0

NORMAL DEPTH CHANNEL ROUTING

QN(1)	QN(2)	QN(3)	ELNVT	ELMAX	RLNTH	SEL
.0700	.0500	.0700	1620.0	1638.0	270.	.00900

CROSS SECTION COORDINATES--STA,ELEV,STA,ELEV--ETC
100.00 1638.00 140.00 1627.80 180.00 1627.00 192.00 1620.00 202.00 1620.00
210.00 1627.00 277.00 1633.60 323.00 1638.00

STORAGE	0.00	.07	.15	.25	.36	.49	.64	.80	1.04	1.51
	2.07	2.70	3.42	4.21	5.08	6.03	7.06	8.17	9.36	10.63
OUTFLOW	0.00	26.37	87.08	179.47	304.94	465.64	663.98	902.42	1232.01	1730.43
	2389.97	3207.67	4189.78	5344.29	6679.83	8203.65	9926.18	11857.69	14007.32	16384.06
STAGE	1620.00	1620.95	1621.89	1622.84	1623.79	1624.74	1625.68	1626.63	1627.58	1628.53
	1629.47	1630.42	1631.37	1632.32	1633.26	1634.21	1635.16	1636.11	1637.05	1638.00
FLOW	0.00	26.37	87.08	179.47	304.94	465.64	663.98	902.42	1232.01	1730.43
	2389.97	3207.67	4189.78	5344.29	6679.83	8203.65	9926.18	11857.69	14007.32	16384.06

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HYDROGRAPH ROUTING

ROUTE FLOW THRU 2ND DOWNSTREAM DAMAGE CENTER

ISTAQ	ICOMP	IECON	ITAPE	JPLT	JPRT	INAME	ISTAGE	IAUTO
4	1	0	0	0	0	1	0	0

ALL PLANS HAVE SAME ROUTING DATA

QLOSS	CLOSS	AVG	IRES	ISAME	IOPT	IPMP	LSTR
0.0	0.000	0.00	1	1	0	0	0

NSTPS	NSTDL	LAG	AMSKK	X	TSK	STORA	ISPRAT
1	0	0	0.000	0.000	0.000	0.	0

NORMAL DEPTH CHANNEL ROUTING

QN(1)	QN(2)	QN(3)	ELNVT	ELMAX	RLNTH	SEL
.0700	.0500	.0700	1400.0	1414.0	8200.	.02700

ROBINSON DAM
BREACH ANALYSIS
PAGE 3/6

CROSS SECTION COORDINATES--STA,ELEV,STA,ELEV--ETC
100.00 1414.00 120.00 1406.00 170.00 1403.00 175.00 1400.00 178.00 1400.00
185.00 1405.00 246.00 1406.00 270.00 1414.00

STORAGE	0.00	.57	1.46	2.66	4.17	6.66	10.99	17.31	29.68	47.28
	65.52	84.33	103.69	123.62	144.10	165.16	186.77	208.94	231.68	254.98
OUTFLOW	0.00	9.81	35.97	81.21	148.82	257.39	424.36	676.95	1096.65	1828.20
	2801.85	3 01	5355.41	6913.70	8651.27	10564.28	12650.10	14906.96	17333.74	19929.80
STAGE	1400.00	1400.74	1401.47	1402.21	1402.95	1403.68	1404.42	1405.16	1405.89	1406.63
	1407.37	1408.11	1408.84	1409.58	1410.32	1411.05	1411.79	1412.53	1413.26	1414.00
FLOW	0.00	9.81	35.97	81.21	148.82	257.39	424.36	676.95	1096.65	1828.20
	2801.85	3 01	5355.41	6913.70	8651.27	10564.28	12650.10	14906.96	17333.74	19929.80

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PEAK FLOW AND STORAGE (END OF PERIOD) SUMMARY FOR MULTIPLE PLAN-RATIO ECONOMIC COMPUTATIONS
FLOWS IN CUBIC FEET PER SECOND (CUBIC METERS PER SECOND)
AREA IN SQUARE MILES (SQUARE KILOMETERS)

OPERATION	STATION	AREA	PLAN	RATIOS APPLIED TO FLOWS RATIO 1 .25
HYDROGRAPH AT	1	.50	1	345.
		(1.29)		(9.77)(
			2	345.
				(9.77)(
			3	345.
				(9.77)(
			4	345.
				(9.77)(
ROUTED TO	1	.50	1	262.
		(1.29)		(7.42)(
			2	7399.
				(209.52)(
			3	2932.
				(83.02)(
			4	1871.
				(52.97)(
ROUTED TO	2	.50	1	263.
		(1.29)		(7.44)(
			2	7162.
				(202.79)(
			3	2885.
				(81.68)(
			4	1877.
				(53.16)(
ROUTED TO	3	.50	1	264.
		(1.29)		(7.46)(
			2	6808.
				(192.79)(
			3	2884.
				(81.66)(
			4	1880.
				(53.24)(
ROUTED TO	4	.50	1	258.
		(1.29)		(7.32)(
			2	4062.
				(115.03)(
			3	2535.
				(71.79)(
			4	1618.
				(45.81)(

ROBINSON DAM
BREACH ANALYSIS
PAGE 4/6

SUMMARY OF DAM SAFETY ANALYSIS

PLAN 1 .....

	INITIAL VALUE	SPILLWAY CREST	TOP OF DAM
ELEVATION	1643.00	1643.00	1644.20
STORAGE	150.	150.	190.
OUTFLOW	0.	0.	45.

RATIO OF PMF	MAXIMUM RESERVOIR W.S.ELEV	MAXIMUM DEPTH OVER DAM	MAXIMUM STORAGE AC-FT	MAXIMUM OUTFLOW CFS	DURATION OVER TOP HOURS	TIME OF MAX OUTFLOW HOURS	TIME OF FAILURE HOURS
.25	1644.79	.59	212.	262.	8.00	42.00	0.00

PLAN 2 .....

	INITIAL VALUE	SPILLWAY CREST	TOP OF DAM
ELEVATION	1643.00	1643.00	1644.20
STORAGE	150.	150.	190.
OUTFLOW	0.	0.	45.

RATIO OF PMF	MAXIMUM RESERVOIR W.S.ELEV	MAXIMUM DEPTH OVER DAM	MAXIMUM STORAGE AC-FT	MAXIMUM OUTFLOW CFS	DURATION OVER TOP HOURS	TIME OF MAX OUTFLOW HOURS	TIME OF FAILURE HOURS
.25	1644.75	.55	211.	7579.	1.56	41.66	41.33

PLAN 3 .....

	INITIAL VALUE	SPILLWAY CREST	TOP OF DAM
ELEVATION	1643.00	1643.00	1644.20
STORAGE	150.	150.	190.
OUTFLOW	0.	0.	45.

RATIO OF PMF	MAXIMUM RESERVOIR W.S.ELEV	MAXIMUM DEPTH OVER DAM	MAXIMUM STORAGE AC-FT	MAXIMUM OUTFLOW CFS	DURATION OVER TOP HOURS	TIME OF MAX OUTFLOW HOURS	TIME OF FAILURE HOURS
.25	1644.76	.56	211.	3395.	1.84	42.06	41.33

PLAN 4 .....

	INITIAL VALUE	SPILLWAY CREST	TOP OF DAM
ELEVATION	1643.00	1643.00	1644.20
STORAGE	150.	150.	190.
OUTFLOW	0.	0.	45.

RATIO OF PMF	MAXIMUM RESERVOIR W.S.ELEV	MAXIMUM DEPTH OVER DAM	MAXIMUM STORAGE AC-FT	MAXIMUM OUTFLOW CFS	DURATION OVER TOP HOURS	TIME OF MAX OUTFLOW HOURS	TIME OF FAILURE HOURS
.25	1644.76	.56	211.	2070.	2.21	42.54	41.33

ROBINSON DAM
BREACH ANALYSIS

PLAN 1 STATION 2

RATIO	MAXIMUM FLOW,CFS	MAXIMUM STAGE,FT	TIME HOURS
.25	263.	1624.6	42.00

PLAN 2 STATION 2

RATIO	MAXIMUM FLOW,CFS	MAXIMUM STAGE,FT	TIME HOURS
.25	7162.	1634.4	41.67

PLAN 3 STATION 2

RATIO	MAXIMUM FLOW,CFS	MAXIMUM STAGE,FT	TIME HOURS
.25	2885.	1630.0	42.00

PLAN 4 STATION 2

RATIO	MAXIMUM FLOW,CFS	MAXIMUM STAGE,FT	TIME HOURS
.25	1877.	1628.6	42.67

PLAN 1 STATION 3

RATIO	MAXIMUM FLOW,CFS	MAXIMUM STAGE,FT	TIME HOURS
.25	264.	1623.5	42.00

PLAN 2 STATION 3

RATIO	MAXIMUM FLOW,CFS	MAXIMUM STAGE,FT	TIME HOURS
.25	6808.	1633.3	41.67

PLAN 3 STATION 3

RATIO	MAXIMUM FLOW,CFS	MAXIMUM STAGE,FT	TIME HOURS
.25	2884.	1630.0	42.33

PLAN 4 STATION 3

RATIO	MAXIMUM FLOW,CFS	MAXIMUM STAGE,FT	TIME HOURS
.25	1880.	1628.7	42.67

PLAN 1 STATION 4

RATIO	MAXIMUM FLOW,CFS	MAXIMUM STAGE,FT	TIME HOURS
.25	258.	1403.7	42.33

PLAN 2 STATION 4

RATIO	MAXIMUM FLOW,CFS	MAXIMUM STAGE,FT	TIME HOURS
.25	4062.	1408.1	42.00

PLAN 3 STATION 4

RATIO	MAXIMUM FLOW,CFS	MAXIMUM STAGE,FT	TIME HOURS
.25	2535.	1407.2	42.33

PLAN 4 STATION 4

RATIO	MAXIMUM FLOW,CFS	MAXIMUM STAGE,FT	TIME HOURS
.25	1618.	1406.4	43.00

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**********************************
FLOOD HYDROGRAPH PACKAGE (HEC-1)
DAM SAFETY VERSION     JULY 1978
 LAST MODIFICATION  01 APR 80
**********************************
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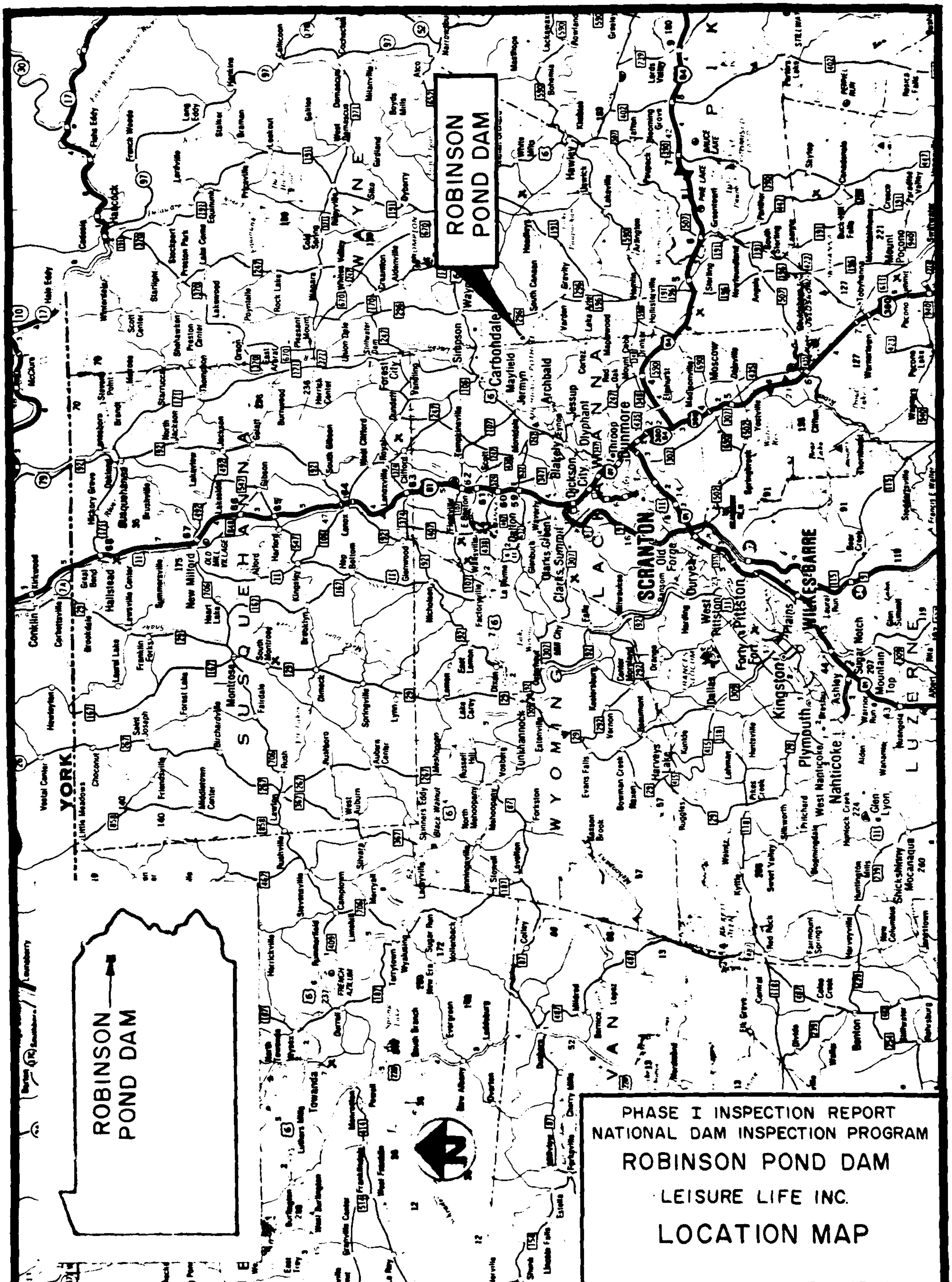
STATION 3 = 1ST DOWNSTREAM DAMAGE CENTER
DAMAGE AT ~ ELEV 1633

STATION 4 = 2ND DOWNSTREAM DAMAGE CENTER
DAMAGE AT ~ ELEV. 1412

NOTE: PLAN 1 IS NON FAILURE,
OTHER PLANS ARE FAILURE
PLANS

APPENDIX E

PLATES



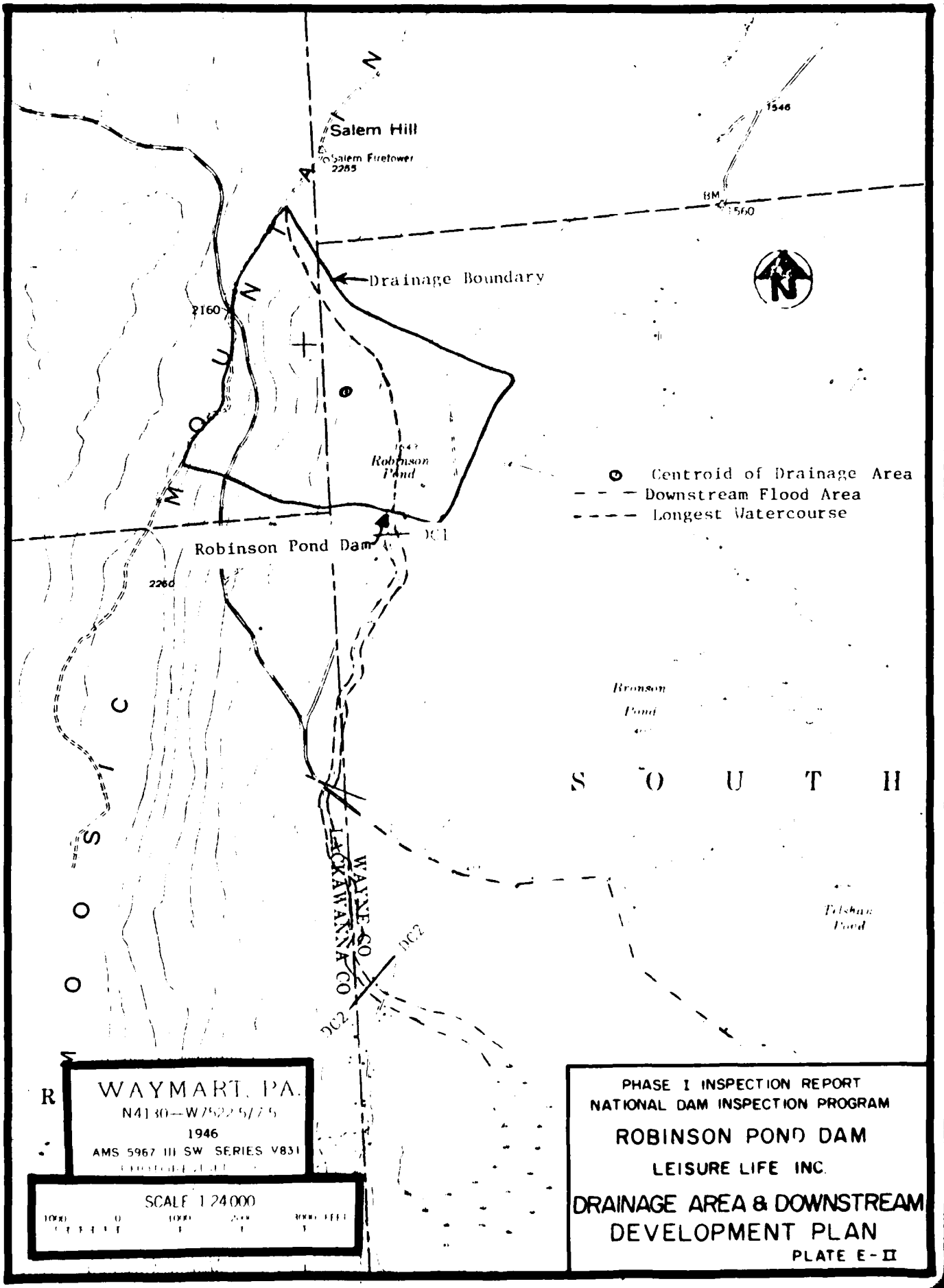
PHASE I INSPECTION REPORT
NATIONAL DAM INSPECTION PROGRAM

ROBINSON POND DAM

LEISURE LIFE INC.

LOCATION MAP

PLATE E-I


Salem Hill
Salem Firetower
2285
1546
BM
1560
Drainage Boundary
2160
Robinson Pond
Centroid of Drainage Area
Downstream Flood Area
Longest Watercourse
Robinson Pond Dam
DC1
2260
Bronson Pond
S O U T H
M O U N T A I N
S U S Q U E H A N N A
WAYNE CO.
LACKAWANNA CO.
DC2
DC2
Tobyhanna Pond
WAYMART, PA.
N4130—W7522.5/7.5
1946
AMS 5967 III SW SERIES V831
SCALE 1:24000
1000 0 1000 2000 3000 FEET
PHASE I INSPECTION REPORT
NATIONAL DAM INSPECTION PROGRAM
ROBINSON POND DAM
LEISURE LIFE INC.
DRAINAGE AREA & DOWNSTREAM DEVELOPMENT PLAN
PLATE E-II

APPENDIX F

GEOLOGY

APPENDIX F - GEOLOGY

ROBINSON POND DAM
General Geology

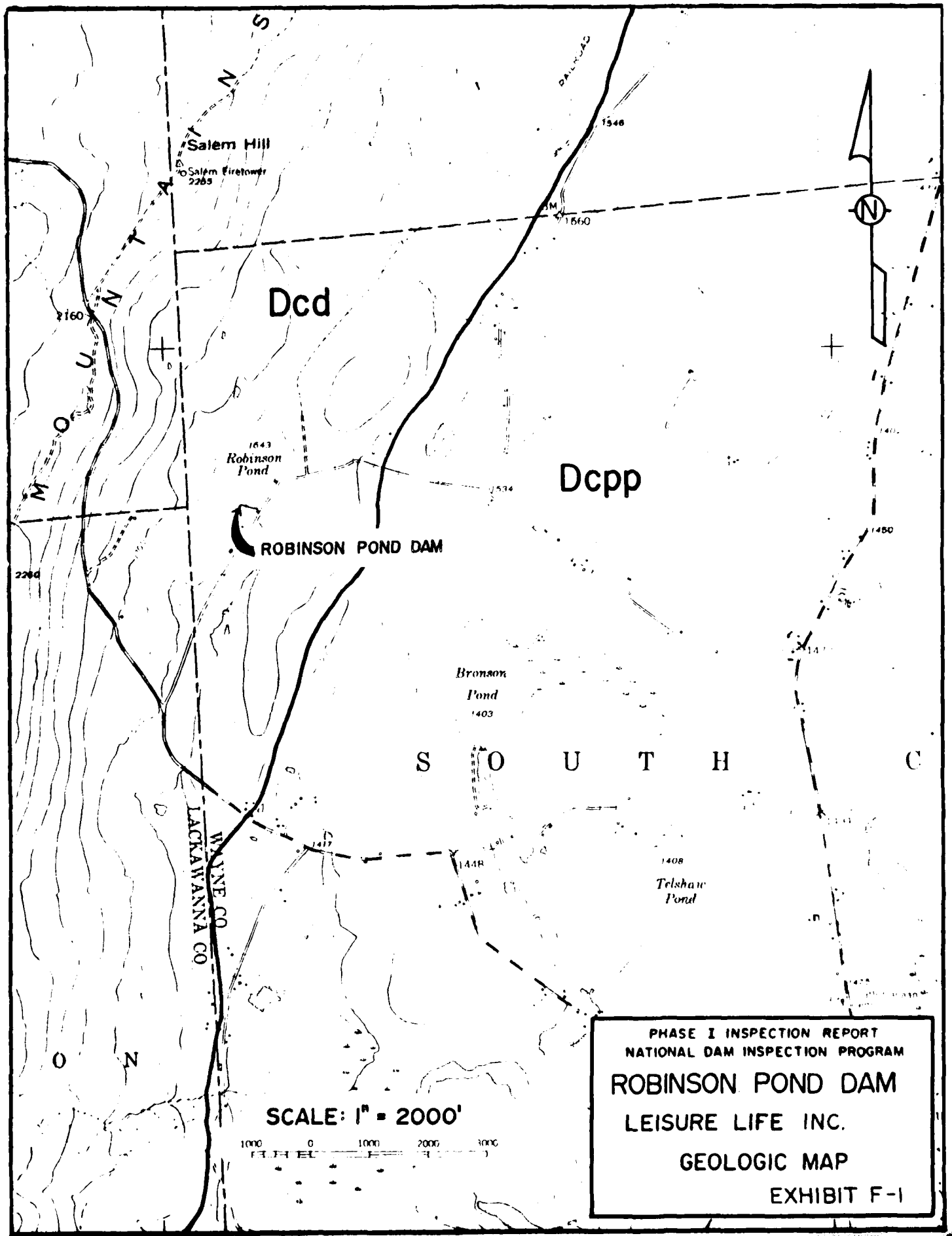
Bedrock at Robinson Pond (southwest quadrant, Waymart, Pa. 7 1/2-minute quadrangle) is the Duncannon Member of the Catskill Formation. It is interbedded red and gray sandstone, red siltstone and red mudstone. The sandstone is fine and very-fine grained, silty, poorly sorted, micaceous, and locally conglomeratic. The rock is well bedded, medium-thick to massive with both planar and cross bedding. Joints are well developed in a blocky and tabular pattern, generally closely spaced (2 inches to 2 feet) except widely spaced in mudstone. Joints are open, narrow and steeply inclined to bedding. Rock exposures are slightly weathered to a shallow depth; weathered surfaces are hackly except smooth on mudstone. Fragments are blocky, 2 inches to 2 feet.

A moderately thick soil cover may be present with material derived from weathering of the ridge to the west. Test pits that were dug prior to construction of the dam indicated that the foundation is clay.

Legend (Bedrock)

Dcd CATSKILL FORMATION, DUNCANNON MEMBER - Grayish-red sandstone, siltstone, and claystone in fining - upward cycles; conglomerate occurs at the base of some cycles.

Dcpp CATSKILL FORMATION, PACKERTON Mbr. through POPLAR GAP Mbr. Fine to medium-grained gray sandstones, well-indurated to quartzitic; sandstones grade upward into grayish-red siltstones and shales.



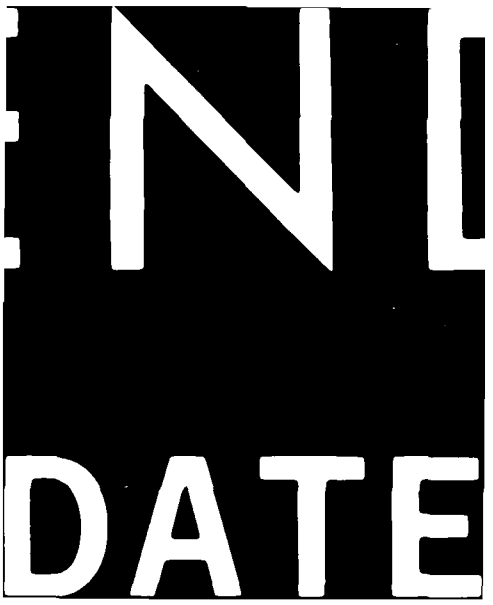
PHASE I INSPECTION REPORT
NATIONAL DAM INSPECTION PROGRAM

ROBINSON POND DAM

LEISURE LIFE INC.

GEOLOGIC MAP

EXHIBIT F-1


N
DATE